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THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

1923

Operative Dentistry in Childhood —*Guthrie*

Osteomyelitis of the Jaws—McGee

Children's Teeth from the Viewpoint of an Orthodontist—*Baker*

The Chemistry of the Dentifrice Problem —*Pfanstiehl*

Fixed Bridgework on Vital Abutments —*Knapp*

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Report of the Educational Committee of Minnesota

Investing on the Installment Plan

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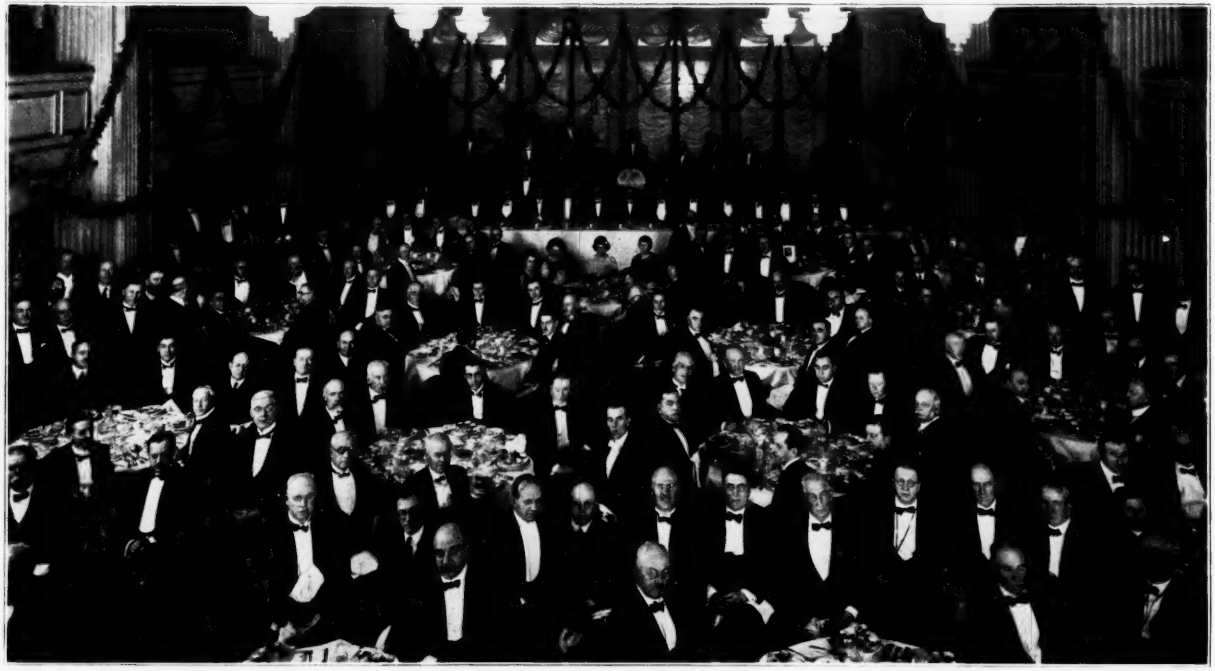

COMPLIMENTARY BANQUET TENDERED TO THOMAS J. BARRETT, D.D.S., JANUARY 8, 1923, WORCESTER, MASSACHUSETTS

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Original Communications

OPERATIVE DENTISTRY IN CHILDHOOD

By HAIDEE WEEKS GUTHRIE, D.D.S., New Orleans, Louisiana

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

THE dentistry of childhood is a new field. We look in vain for a text-book on the subject. We can count on our fingers the dentists in this country who, outside of orthodontia, are specializing in dental work for children. When we think of the enormous field, we would marvel if we did not know the reason.

In a zoological garden when some of the animals need dental care, force is employed and suitable tethers and restraints for the patients used. The dentist is estopped from employing all of these and is required first to convince the parent that work is necessary, and secondly, (most important of all) the child himself.

One finds himself at the beginning of writing anything on child dentistry about to plunge into the field of psychology. Success in this work surely must travel over this route if it comes at all. Be our operator ever so skillful, and trained in every scientific department of dental education, unless he be a practical psychologist, specializing in the child, he will fail utterly.

I have had the good fortune to secure the aid of beneficent individuals and welfare organizations in the establishment of one of the first dental clinics (1914) for children established in a large city. The material has been abundant and most varied.

A certain temperamental endowment of vitality with good health has enabled me to personally see and serve a very large number of patients in these clinics and in private practice. Help offered in the

administration on the clinics has enabled me to keep records which although not absolutely complete, contain all essential data regarding the child.

1. Management of Patients

This report (1) is based on the case records of more than ten thousand children. In point of age, the patients range from infancy to the sixteenth year.

The data collected showed the age, sex, race, nutrition and the history of previous infections. The grade in school and whether or not the child was a "repeater" were also recorded. The number of deciduous and permanent teeth present, as well as the existence of cavities, abscesses or sinuses, and their location, were noted in every case.

Special dyscrasias, when existent, were also noted, as well as abnormal frenum, fifth cusp and geographic tongue. Roentgen findings and the results of Wassermann reactions were also recorded when these examinations were made.

It may seem that these details of the method of receiving the child and the initial steps of the examination are things too trivial for such a group of hearers as this. However, let it be emphasized that success with the operative work of children is very largely a matter of morale and the application of the rather simple principles of the psychology of the child.

The child must not be awed by the appearance of complicated equipment which will bewilder him. The average child has often had the fear of the dentist taught him from birth. So the calmer, firmer, more cheerful we can be the greater our success. The child must walk in and seat himself comfortably in the chair. I always ask his name, birthday, comment on his clothes, socks, etc., while the towel is being put on the child, and in answering these questions his mind has been diverted. He is asked questions as to what made the tooth ache, etc., and if it is necessary to extract, he is told that it will hurt just a little bit and be over in an instant. The child realizes a service done him and gives proof of his gratitude in his future behavior. The child who has never been to the dentist, and who is distrustful is given the pleasure of a ride up and down in the chair, shown how the engine works, the spray bottles, etc. The different children need different treatment. One thing is necessary, "decision." We let the child feel that he is helping in everything we do, and he in turn will feel that if he suffers some, his cooperation is to immunize the pain. The slightest vacillation is fatal to success. We never deceive the child in the slightest degree. Usually the most perfect frankness gains his confidence at the start, and the day is won.

II. Examination of Patient

In examining the mouth of the infant, we should look at the region where, according to age, the tooth should erupt; second, we should examine for lesions of the mucous membrane; and third for abnormal frenum.

As the older child walks into the room we judge his size, hair, complexion, eyes, nose, shape of face, stature, carriage, etc. and record all abnormalities observed. When he gets into the chair we have made a fair diagnosis as to his mental and physical condition. His age, weight, previous illnesses, whether a repeater in school, breast or bottle-fed, are next determined. The examination of the lymphatic glands, and lip conditions noted. He is made to swallow, breathe and open and close the mouth, and move the jaws laterally. A crackling sound due to an abscess condition in the deciduous molars sometimes occurs and is worth looking for. The child is made to open his mouth and the tonsillar condition is noted. The condition of the soft tissues; the existence of abnormal labial or lingual frenums are of course observed. Sinuses or pockets around the teeth and condition of periodontal membrane are now looked for.

Next we observe the number of perma-

nent teeth erupted; the number of vital and non-vital teeth and the number of missing teeth. Angle's classification of malocclusion if any is present is now made, and cavities in permanent and deciduous teeth are noted.

The shape, size and condition of the deciduous and permanent teeth often enables us to aid the pediatrist in a diagnosis. The retarded absorption of the deciduous teeth always requires an explanation. First, a radiograph should be made to determine the presence and location of the permanent tooth. Second, when a history of non-absorption of any deciduous tooth is obtained, and family history is lacking, a Wassermann reaction will many times furnish the explanation of the cause of the condition.

III. Treatment of Dental Caries

The treatment of caries in the child's mouth should be no different from treatment of the adult's mouth (1). It is the difference in the age.

Between the third and fifth year in my opinion is the average "abscess" age. It is during these years that we have our greatest struggle.

"There is no condition in the tissues of the child's teeth which is any different from that occurring in the adult's teeth," (2a). The same fillings can be placed, if we can prepare the cavities in the same way. In a child of three with a distoclusal cavity in a lower first deciduous molar, when the debris is removed we find nearly always that the mesial of the second deciduous is also involved. In these conditions, at this age, I use a 15-8-12 right and left spoon or hatchet removing the debris, seal in a dressing of Black's 1-2-3 with guttapercha, and burnish the margins with a hot beaver tail. Eucalyptol is wiped over the margins, the child is made to bite to take away all excess, leaving the filling perfectly smooth. Many times these treatments are carried on for several months, and finally a guttapercha is put in which is kept in place until the time for the eruption of the permanent tooth. I have extracted deciduous teeth with guttapercha fillings which have been in use for six years.

Where it is possible I always prefer to use a permanent filling. In the pits and fissures of the permanent molars I use amalgam. I am a firm believer in permanent work where it can be placed.

In a deep occlusal cavity in a badly broken down permanent molar, say about the seventh year, a roentgenogram should be made to show the pulp condition, etc. All overhanging enamel is broken down, the cavity prepared as well as we dare, a dressing of Black's 1-2-3 placed over the pulpal wall and a guttapercha filling placed for six weeks. At the end of six weeks this is removed, a fresh dressing placed and the patient dismissed for a two months' respite. Depending on the condition of the tooth at this time we decide whether we continue treatment, fill it permanently or extract it. We must remember if there is an ideal time for the extraction of the first molar it is about the seventh year. A rule of my practice is "a carious tooth which cannot be filled must be extracted."

IV. Relation of the Growth and Shedding of the Deciduous Teeth and Their Treatment

The eruption of the teeth is a physiological process. It is nearly always associated with disturbances of function which are pathological. The process by which the tissues are forced out of the way is one of absorption under pressure. The cusps of the teeth, as you well know, act as the irritant which produces the stimulus to the absorption, in consequence of which the tissues are painful and tender. A hyperemic condition can be noted at a glance besides the other phenomena accompanying inflammation. The parts become hot and a desire is manifested to bite cold things in order to relieve pressure irritation. This is

nature's provision for forcing the gum tissue away.

"The calcification of the deciduous central begins about the seventeenth week of fetal life. The teeth and roots are complete at three years," (3a). To this, there are many variations. In one hundred cases of syphilitic patients my records show an average of sixteen teeth at the age of one year, an average of six to eight months earlier than normal healthy children. Many of these present as little parallel slats, the same measurement at the incisal edge as at the gingival. There is an equal space between each upper central and lateral and the same condition on the lower.

"Absorption of the central begins at the fourth year and is ended at seven, or the rule, central at four, lateral at five, skip a tooth and a number, first deciduous molar at seven, second deciduous molar at eight, and cuspid at nine," (3b). Absorption of the roots averages three and a half to four years. With the lower anterior this is more nearly the average. The uppers vary a little more, and there is quite a marked difference in the deciduous molars, particularly the lowers. In over one thousand cases this year, I have recorded under the ninth year.

Age	No. of Bicuspids	Cases
5	2	5
6	4	21
6	5	24
6	6	3
7	1	53
7	6	40
7	7	50
8	8	200
8	7	75
8	6	125
9	8	500

In these cases the deciduous tooth had been lost through chronic abscesses. The death of the pulp in a deciduous tooth in no way affects the absorption. The absorption is affected solely by the physiological condition at the apex.

Many times a permanent tooth may be deflected from its normal position by the retention of the deciduous tooth. The anterior teeth are more often deflected labially. Sometimes the upper roots are pushed through and cause an irritation to the upper lip.

For six years I have been using $AgNO_3$ and Formalin in the treatment of chronic abscesses in the deciduous molars. Many have been cured. They have, however, been retained until the immediate eruption of the bicuspid, following the extraction of the deciduous,—and neither showed imperfect enamel nor a sign of $AgNO_3$ on the enamel.

The tooth most often lacking is the second bicuspid. In discussions with many older practitioners, they will say "it was probably extracted for a baby tooth, or the bud was extracted with the deciduous molar." Radiographs will bear me out that the tooth which is most often missing is the second bicuspid. Is it on account of our soft foods, and the lack of necessary mastication that nature is only giving us what we need. Our dentition was once $\frac{2^{*}\ 1\ 2\ 4}{2\ 1\ 2\ 4}$. Now it is $\frac{2\ 1\ 2\ 3}{2\ 1\ 2\ 3}$, and many times $\frac{3\ 2}{3\ 2}$ for think of what a horror the wisdom tooth is to so many. Will the bicuspid be deprived us? In three families I have noted the missing bicuspids in three generations. In the case of the missing lateral the deciduous will absorb and drop out, while the deciduous cuspid and bicuspid will remain in place. In the adult the irritation of a retained deciduous cuspid by the preparation of a cavity for filling will sometimes cause apical absorption and in a few months the tooth will be lost.

V. Absorption of Deciduous Teeth and Eruption of Permanent Teeth. Accidents During Absorption

Pathological conditions at the apex of the root will stimulate the process of absorption (2b). The rhachitic or anemic child will not have perfect absorption. Permanent teeth are deflected in their eruption by the failure of absorption of

the roots of the temporary teeth. The bicuspid is often held back by the lack of absorption of the roots of the temporary molars. This will not happen if the X-ray is used to determine at the time of eruption the cause of the delay, and the obstructive deciduous tooth extracted.

An abscess at the root of a deciduous molar occurring between the ages of two and a half and three years when the enamel of the crown of the bicuspid is in the process of formation sometimes interferes with the function of the enamel organ and the bicuspids thus formed exhibit symptoms of atrophy. Atrophy occurs occasionally in the lateral incisor. In case of anomaly of eruption, we should determine the cause by the X-ray.

I have seen numbers of cases where records show that in the syphilitic there is an earlier eruption of the anterior teeth. In ninety-two per cent of syphilitic parents examined there were oral abnormalties. In ninety per cent of cases of fused teeth, the radiograph shows a missing permanent tooth.

In cases of ulcerative stomatitis, where the hard and soft tissues have to be removed, I have noticed the early eruption of the tooth bud, many times the crown only being imperfectly formed. I have watched five of the cases, bicuspids all of them for three or four years, and there is still no further formation of the tooth, scarcely enough root formation to maintain them in the mouth.

Two special groups of sixty children each were studied; one group known to be tubercular and one made up of proven subjects of syphilitic infection (1). These were observed to determine the value of thorough dental care under the particular conditions. In the tubercular group, ninety-five per cent of the deciduous teeth had to be removed before the eighth year on account of abscesses. In the syphilitic group, only forty per cent had to be removed. More cases of retarded absorption of the deciduous roots and later eruption of the permanent teeth were noted in the syphilitic group than in the tubercular. In nine cases of the sixty, at the thirteenth year, I had series of roentgenograms made to determine the conditions of the deciduous roots. The roentgenograms disclosed a beginning absorption. In these nine cases the eight deciduous teeth (right and left upper and lower, first and second deciduous molars,) were extracted, first on one side, upper and lower, and then in about six weeks, on the opposite side. In a few months the permanent teeth were in correct position.

VI. Caries in Deciduous Teeth. Incisors, Cuspids and Molars

Whatever at the seventeenth week of fetal life to the third year interferes with the nutrition of the child will interfere with the formation of the enamel and dentin, and will produce malformation. In the zone of calcification malnutrition is manifested by transverse bands of atrophy. At the age of one year the child has both upper and lower deciduous centrals and laterals erupted, and one-quarter of the crown of the first permanent molar formed; and prophylaxis must be instituted.

At two years of age, the child has all teeth except the second deciduous molars which are partly in position. The first permanent molar is about one-half completed. Often caries is found at the age of two in the approximal surfaces of the anterior teeth. In the treatment of these lesions by using sharp chisels the overhanging enamel can be broken away, the dentin sterilized with a silver nitrate applied in saturated solution. It is rare at this age to find cavities in the posterior teeth.

The absorption of the roots of the central incisors begins at the age of four, that of the roots of the lateral at five. Frequently, at between four and five years, we find simple occlusal cavities in the deciduous molars, as well as approximal cavities. Care must be given

to retain the deciduous teeth until the proper time for replacement by the permanent set. Abscess is frequent at this time. In my experience this is more often noted in the first deciduous molar than in the second. Chronic abscess with a small sinus to the buccal side is frequently found, of the existence of which both parent or child were unaware.

"Acute abscess in the sense that is conveyed by the use of this term in dental literature was never seen in this series. Undoubtedly there must be an acute phase of the lesion, but evidently the subjective discomfort does not bring the child to the dentist. In the child, the periodontal membrane really exists as a definite structure differentiated from the bony walls which support it. Later, it takes on a bony structure by the migration of bone cells into the stroma and becomes itself truly bony," (1).

I have previously called attention to the relative infrequency of acute abscess in the child's mouth in my series of cases, and this has given rise to much thought and study. Why do we not hear the child crying and screaming with the pain in the deciduous teeth, as we do with the pain in disease of the first permanent molar? In the child under six, we often find a swelling, pus and perhaps a sinus before the child has given any sign of inconvenience.

The difference in structure and progressive hardening of the periodontal membrane is probably the explanation of the difference in the occurrence of acute abscess in childhood as contrasted with the more advanced years. Apparently it is only after fistula, sinus or free pus discharge is established that the child comes for help.

In about seventy per cent of the cases the tooth may be saved between the fourth and sixth year, by forcing a saturated solution of silver nitrate through the root and sinus, followed by formaldehyde solution, and sealing with guttapercha for two weeks. Sometimes it takes two months of treatment, but we have maintained the tooth for usefulness for four or five years. Following the abscesses of the deciduous molars, it is surprising how quickly the bicuspid erupts. The following case history is illustrative: A lower right first deciduous molar abscessed at the age of five years. It was treated after this plan, cured, (roentgenographed many times), and filled with amalgam. The roentgenogram revealed completely absorbed roots, and a perfectly formed bicuspid erupted. At the age of ten, the patient still has seven deciduous molar teeth, the last roentgenograms showing very little absorption of the deciduous roots.

Following these abscess conditions we have an abnormally rapid absorption of the deciduous tooth and a correspondingly rapid formation of the permanent tooth (1). Whatever irritant stimulates the osteoclasts in the absorption of the deciduous tooth also stimulates the osteoblasts in the formation of the permanent tooth. These conditions we find between the ages of three and five. If these teeth are erupted in infancy earlier than in a more northern latitude, the earlier eruption time may account for the earlier decay.

The sallow, nervous, anemic child between four and six years old will more often than not be found with decayed, abscessed deciduous molars (4). It is at this time that the harder, heavier foods become necessary for the nourishment of the child. He cannot masticate these without the necessary teeth. I have records of many hundreds of cases of malnutrition, between the ages of four and six, where considerable anemia existed, and where no improvement was manifested after more or less continuous medical treatment. Medical and dietetic prescriptions had brought but a slight degree of benefit until attention was given to the mouth. It is very striking to see how much improvement results from the removal of abscessed conditions and

the institution of a regimen of oral hygiene.

Beginning at about the age of two and a half years there is a growth of the jaws which causes the separation of the teeth in the normal child. The importance of prophylaxis must be stressed at this age. In the anterior decays, the undermined enamel should be cut away and silver nitrate applied. In the posterior teeth, amalgam should always be used for occlusal cavities and beginning mesiodistal and distoclusal cavities. In deep mesiodistal and distoclusal cavities base plate guttapercha is used.

VII. Permanent Teeth During the Childhood Period

In Louisiana my records indicate that the average age for the eruption of the permanent teeth is from eight to twelve months earlier than that observed in colder climates (2c). If the deciduous central has not been exfoliated at the age of seven, an X-ray examination should be made of the root of the deciduous tooth and the position of the permanent one. This nearly always shows that the deciduous tooth should be extracted.

The temporary molars are often retained owing to the lack of absorption. If by the tenth year, they are still in position, radiographic examination should be made which is our guide to treatment.

The eruption of the permanent teeth is the same as the absorption of the deciduous teeth. You will remember that each permanent tooth is formed from a bud of a deciduous tooth, except the first permanent molar, which has its bud thrown off posterior to the enamel organ of the temporary teeth. This occurs about the seventeenth week. At the ninth month the follicile is complete, and calcification has begun. The second molar is derived from the outer tunic of the first, and the third molar from that of the second. The roots of the teeth are not complete until from three to five years after eruption. There are as many variations in the eruption of the permanent set as in the absorption of the deciduous set. These variations cause difficulties in diagnosis. In the proper use of the Roentgen ray, however, we have a method of overcoming these difficulties in most cases. It is hazardous indeed to undertake the devitalization of the pulps of the permanent teeth in the mouth of the child unless one has a radiograph disclosing the condition of the roots.

We often see imperfections in the enamel and dentin of the centrals, cuspids, and first molars due to lack of nutrition during the period of the formation of these teeth.

Treatment of the permanent first molar. The most important tooth with which we have to deal is the first molar. It conceals its arrival by erupting posterior to the deciduous teeth without any inconvenience to the child. It is not heralded by the exfoliation of any of the deciduous teeth. The first molar is not thought to be a permanent tooth by the laity, and is therefore the more neglected tooth and more liable to become carious. No tooth is so often lost from inattention during the time of its development, and no tooth is more easily conserved by proper attention correctly timed. When this tooth is lost early by caries there is a distortion of the face resulting in malocclusion, a lack of contact of the permanent teeth, which is one of the causes of gingivitis resulting in pyorrhea. Caries in the first molar generally occurs first in the mesial, central and buccal pits, and these cavities should be filled permanently as soon as found, carrying the extension to sharp grooves where we may obtain good finishing points. In occlusal caries involving a large amount of dentin, the excavation should be made in two sittings to avoid a nervous shock to the child, and a hyperemia of the pulp which may result.

We use guttapercha. The patient is dismissed for six weeks, when the cavity

may be properly excavated and permanently filled.

Pulp exposure and its treatment: Should the pulp be exposed accidentally by a sharp instrument, a capping of guttapercha should be applied. The field must be aseptic, the rubberdam is placed, the walls of the cavity cleansed and wiped with eucalyptol. A guttapercha disc held in readiness to fit the pulpal wall of the cavity, is warmed to body temperature and depressed slightly in the center of the surface placed next to the pulp, with no space for air or transudate from the pulp. A drop of chloropercha is placed occlusally of the disc and tapped in place. The affinity of eucalyptol for guttapercha holds it in contact with the cavity walls. The remainder of the cavity may be filled with guttapercha. An X-ray should be made at once and kept on record. At the end of six months, if no inconvenience is felt in the meantime, and the X-ray shows the pulp to be vital, a permanent filling may replace the guttapercha filling. The irritating action of the zinc oxyphosphate, oxychloride, and oxysulphate cements on the sensitive dentin precludes their use in this location.

A pulp exposed by caries before the completion of the roots of the tooth should be extracted at once to prevent any further trouble or alveolar abscess.

Treatment of Incisors: Lingual pits in incisors are found about the eighth year, and should be permanently filled. Approximal cavities in the incisors may be found at this time also, but on account of the age of the child these are difficult to manage; and "extension for prevention" must be used. The teeth are about one-third covered with gum tissue at this time. Great care must be exercised in excavating, as the pulps are very much larger than in the adult, and the danger of exposure is greater.

The open apical ends of roots are a menace in all operations during childhood. The pulps of the lateral incisor are larger and more liable to exposure than any other tooth. In consequence, difficult root-fillings occur earlier than with any other tooth, likewise more frequent mishaps.

Nothing I have been able to state here with a fair degree of certainty, could I have done without the records I have of my cases. The information to be derived from systematic keeping of standard records by workers in this field is vast, and of inestimable value. In this connection I would like to suggest that it might be within the province of such a body as this to devise a standard case history blank, the filling out of which would result in the compilation, on a large scale, of data which would be of vast usefulness. Such a standard form, if it had the approval of this body, would quickly find its way into the hands of all who are examining children's mouths in schools, in institutions, and in welfare work.

I am convinced of the necessity of filling all cavities in the child's teeth whenever they are found. If this be impossible, an extraction is necessary. Very sharp instruments and a finished technic are most essential. Usually no other anesthesia is practical in the child. It is most striking how much may be done with perfect instruments in deft hands.

Our measure of success is in childhood, the preservation of the deciduous denture until such time as the permanent set is ready to erupt. Obviously, the filling and care of the deciduous teeth is only to be done by prophylaxis and removal of decay and filling. Extraction is the evidence of a failure to do these things and is a last resort for the reasons cited above.

Study of the factors influencing the age of eruption of the various teeth has shown: Congenital syphilis hastens the eruption of deciduous teeth by a period of between six and eight months. Congenital syphilis hastens the eruption of the deciduous teeth but delays the ab-

sorption of their roots. In consequence, we see a delay in the eruption of the permanent set. Chronic abscess on deciduous teeth likewise hastens the eruption of the permanent teeth.

The effect of climate upon the age of eruption is marked. In the state of Louisiana there is an age of eruption of the permanent molar earlier by eight to twelve months than in the state of Illinois. I have been able to compare records as to age of eruption in both these states.

Acute abscess rarely occurs in deciduous teeth, probably due to the softer nature of the child's tissues which allow drainage with a greater degree of ease. Chronic abscess does occur and is usually accompanied by sinus formation. Chronic abscess about the roots of the deciduous teeth hastens the absorption of these roots and partly in consequence, perhaps of hyperemia, and partly of mechanical removal of these roots, the eruption of the permanent teeth is hastened.

I have had a marked success in treating chronic abscess in deciduous molars with saturated silver nitrate solution followed by formalin. Whatever measure will add to our resources in striving to preserve the first molar will insure a more perfect development of the jaw, better occlusion, and easier preservation of the permanent teeth. Too great emphasis cannot be laid on the importance of guarding this tooth.

He who would be successful in the dentistry of childhood must first acquire the very difficult art of projecting himself into the child's mind in order that he shall appreciate how he and the operative work he is about to do will appear to the patient.

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Discussion

Thomas B. McCrum, Kansas City, Missouri: There are a number of problems in treating children. Dr. Guthrie said that the work for children was a new field. I would like to call attention, also, to the fact that it is a new thing to present papers on children's dentistry. It has only been the last year or two that papers have been presented on this very important subject.

Dr. Guthrie made the statement that there was no more difference in filling teeth of children between three and five years than there was in filling teeth of adults. I believe there is quite a difference because in filling the first tooth at a certain age, when absorption begins, it requires a very careful and very much different technic in preparing the cavities. When the root begins to absorb, we find, also, an enlargement of the pulp cavity of the deciduous tooth. Consequently, the preparation of that cavity, and taking into consideration the absorption of that pulp cavity, we cannot use the usual method as used in adults' teeth. When we use metal in those first teeth, when that begins to absorb, we find the metal immediately in contact with the pulp cavity, which irritates and soon causes death of the pulp.

We have, first, the problem of being able to handle the child to do what we want to do. Dr. Guthrie said that she had them from a few months. The average dentist, I don't imagine, has many children under two and one-half years of age.

She said that the abscessed deciduous tooth hastens the eruption of the permanent tooth or bicuspids. I didn't know that an abscessed tooth would hasten the eruption of the permanent tooth unless the abscessed tooth was removed. In that case the permanent tooth would erupt a year or a year and a half earlier than it naturally would.

The second problem is, to be able to handle

the child so as to do what we want to do. Dr. Guthrie did not touch on the education of the mother. The old slogan of going to your dentist twice a year is not practical to be used for children. Deciduous teeth and the first molar have to be watched every thirty or sixty days and to give the child the best service we must see him often. In the majority of cases when the child is first taken to the dentist he is suffering from pain. Then is the time to begin teaching the mother the necessity of frequent visits and a regular and systematic prophylaxis for the child. If we don't see the child again for a year the child will need as much, or more dental service than on the previous visit. So there are two problems, first the handling of the child and second, the educating of the mother, so she will appreciate the importance of frequent visits to the dentist and what the teeth mean to the child as well as the saving of the first permanent or six-year molar.

I quite agree with Dr. Guthrie that some form of standardization should be brought about. Quite frequently a dentist taking up children's work or working in clinics seems to have very little understanding of what they should do and the question is often asked, "What should I do first for children?" Some form of standardization so that they would have some idea of the first thing to do, how to start a clinic, would be a splendid thing for the national organization.

M. Evangeline Jordan, Los Angeles, California: I have been working for nearly fourteen years and, while I am not sure I have had ten thousand cases, I would not be surprised if my case records covered that number. Unfortunately, we are not able, in private practice, to apply some of the tests that Dr. Guthrie has made with such success, and I believe that is one of the weakest points in private practice. If we could see that large number of cases due to tubercular or other causes we could work with more confidence.

I am going to speak of the dentist, who thought that children's dentistry was a new subject. In 1910 there was a paper on "Preventive Dentistry" read at the meeting of the National Dental Association and two or three papers at a later date. It is a wonderful thing to have devoted so much time to this subject this year.

We have kept very careful records of the results of deciduous abscesses. The majority of them come to us under five years of age. In an abscessed tooth, the roots do not absorb. If you thoroughly cleanse that tooth and fill the pulp chamber, you will get nearly normal results, but if that tooth is allowed to go on the crown breaks off.

There is no question but that the eruption of the biscuspid is hastened by the abscess of the deciduous molar, but I have attributed it to the fact that there is less resistance when that tooth is broken down or extracted. I see from twenty-five to fifty children a day and I feel that we have some ground in thinking that our children do differ from the children of the far South. I believe, also, that a large percentage of Dr. Guthrie's charts were made with colored people.

Dr. Guthrie: I never had a colored child.

Dr. Jordan: Not one? That takes that away then.

I have many records of the enamal organ of bicuspids having been diseased and the enamel badly pitted because of abscess of the deciduous molars. I wish to ask the essayist if she has found that syphilitic children are the ones who more often have the second deciduous molars remaining in position with no successor. In a number of cases where the second bicuspids were missing a positive Wasserman test was obtained, and I did not know whether such a large number of records as Dr. Guthrie has would show that this was the cause.

Paul A. Barker, Denver, Colorado: Dr. Guthrie made a statement as to the filling of deciduous teeth being practically the same as filling permanent teeth. I do not believe many of the people who have done children's work will agree with her on that point. The filling material used, of necessity, must be of a different nature and it requires a different technic.

Dr. Guthrie also makes the statement that the death of the pulp of a deciduous molar does not interfere with the absorption of the root. That is a matter which I imagine will in the future cause considerable discussion. To date we have no authoritative data on it but it has been my experience over several years in both public school clinic work and private work that it does interfere with the absorption of the deciduous roots. I have gone to the length of keeping records of a great many cases of pulpless deciduous teeth in our school clinic in Denver. The majority of these teeth which we have extracted have had malformed or unabsorbed roots. I believe it will be shown in the future that it does interfere. A little later Dr. Guthrie makes the statement, that in her own observation she has noticed that the abscess at a certain age will interfere with the formation of the enamel of the underlying permanent bicuspid. It certainly stands to reason that if the infectious process at the apex of the deciduous roots is great enough to interfere with the formation of the enamel, it would certainly interfere with

the absorption of the deciduous roots. I believe that many of our cases of malocclusion are caused by the fact that the roots of these pulpless temporary molars, having failed to absorb, hold the tooth tightly in place, and when the child is brought to the dentist he finds they are perfectly solid and allows them to remain. Dr. Jordan has had the same experience that I have with the pitting of the enamel of these bicuspids. Dr. Guthrie, I think, is correct in saying that the abscesses of these deciduous molars will in many cases cause a pitting of the enamel of the bicuspid underneath.

Regarding the statement that the abscess would increase the speed of eruption of the permanent teeth, I have never seen that. It may be so. The only way we can get at these things is by such case histories as the essayist has taken. I wish to compliment her on the manner in which she has taken records of these cases.

She speaks of using a saturated solution of silver nitrate forced through the fistula in the treatment of these abscesses. It may be successful in her hands, but to my mind, a saturated solution of silver nitrate used in soft tissue during childhood is a dangerous weapon in the hands of most of us. Silver nitrate has a very definite place in its use in the hard tissues.

Dr. Guthrie also makes the statement that she has never observed an acute abscess of a deciduous molar in a child, that you rarely have them come in crying with pain from a deciduous molar. That is new to me. I have had a great many of them presented to me with just that condition which I would call an acute abscess.

I wish to compliment Dr. Guthrie again upon her attention to detail in the matter of her records and I agree with Dr. McCrum that we should have some standardization of charts so that those doing clinic work could keep very accurate case histories.

Dr. Guthrie (closing): Apparently all I said was not heard. I said that "if" we could prepare the same cavities in children's teeth in the same way we do in the adult's teeth we could put in the same fillings. As to abscess conditions, I have a series of radiographs showing the chronic abscess conditions. If we study bone formation, we will find what stimulation does to the osteoblasts in these chronic abscess condition.

Between the ages of two and one-half and three years I have seen that abscesses in deciduous molars cause atrophy in the bicuspids. I have not seen it later. I have not seen the action of silver nitrate on the enamel. These case reports are not all clinic patients, they are private patients also.

Some children should come for examination every thirty days, others every two months, others every three months. Children in my clinic come every eight weeks. When they come they are accompanied by the toothbrush and they are given personal instruction by the nurses.

In deep seated cavities where I used gutta-percha, there was dead pulp.

In the first clinic I established in New Orleans I had all kinds of people without regard to race, creed or color, and I studied a great many negro children. They appear to have perfect teeth but it is only by contrast that they seem to have perfect teeth. Ninety-nine per cent have caries.

I have seldom seen an acute abscess in the deciduous teeth of children.

OSTEOMYELITIS OF THE JAWS

By REA PROCTOR McGEE, D.D.S., M.D., Pittsburgh, Pennsylvania

(Read before the American Dental Association, Los Angeles, California, July 17-21, 1922)

BONE consists of two integral portions, namely a hard part and a soft part, intimately combined. "The hard part of the bone is composed of a calcified basement substance arranged in little concentric cylinders about a central canal called a Haversian canal; between these cylinders there is a moderate number of cells whose branches anastomose with one another through holes in the cylinders.

"The soft part of the bone is composed of a stroma of connective tissue containing blood vessels, lymphatics and nerves and contains cells called osteoblasts which appear to be concerned in the formation of bone. The soft part of the bone occurs upon the outside of the bone, in the Haversian canals, and within the bone. It is important to remember that the soft part of the bone lying in the Haversian canals is continuous with that upon the outside of the bone, and also with that within the shaft of the bone" (1).

Flat bones have the same general characteristics as long bones and while we do not have a distinct canal for marrow, all of the soft tissue of the bone combined may be generally considered under the same heading that we consider the marrow of the long bones.

The medullary spaces in bones vary greatly in size. As one extreme may be mentioned the large chambers in the shafts of the long bones like the femur. These are especially designed receptacles for the accumulation and storage of fat and myelin, a commodity which is merely a blood-producing element; in other words, a structure which, contrary to the commonly accepted notion, contributes in no respect to the nourishment of the bone which contains it.

Destructive inflammation can and does occur in the soft tissue of any bone that is successfully exposed to infection. If the myelin cells were found only in the marrow of bone, then osteomyelitis could only occur in the long bones but it is a fact that myelin cells are almost as widely distributed in flat bones as they are in the marrow of long bones because marrow as found in the shaft of the femur is 96 per cent fat with only a few myelin cells and all of the other tissue, such as veins, arteries, lymphatics, nerves, osteoblasts and the fatty tissues that are found in that substance.

Whiting (2) very truly says that myelin is not a synonym for bone marrow and he further says that every bone in the body contains marrow or endoseum, that is a soft part upon the integrity of which life of the bone wholly depends, but there are many bones which contain but few myelin cells and some which, in adult life do not contain any.

Stimson (3) in his lectures on bone diseases teaches that by the marrow of bone is to be understood that not myelin only, but all those soft parts which contribute to its nourishment, and he classifies all destructive inflammation of bone resulting from infection as "acute infectious osteomyelitis."

Infectious osteomyelitis is an acute suppurative inflammation of the bone;

it is not a specific disease, having its own characteristic germ but it is an acute inflammation that may be produced by any one of a variety of pathogenic micro-organisms or by a mixed infection. Any pathogenic organism which can be carried in the blood stream may be deposited in the bone and produce suppuration, but there are certain well-known varieties of bacteria which are most frequently encountered as responsible agents.

Nichols, (4) says: "the relative order of frequency with which such micro-organisms in pure culture appear as infective agents in bone inflammation when all the bones of the body are included in the reckoning is first, staphylococcus; second, streptococcus and third, pneumococcus."

We are therefore justified in classifying a bone inflammation as osteomyelitis. The difference in diagnosis is simply a classification of the stage of the infective progress.

In the bones of the face, particularly the maxilla and mandible, osteomyelitis is most frequently caused by the extensive alveolar abscesses. Traumatism from bridges that rest too close to the process, ill-fitting plates, external forces, natural and malocclusion either of teeth or of plates are important factors in the causation of this disease.

In young children the removal of the temporary teeth followed by swelling that lasts more than six days, almost invariably presents some form of osteomyelitis. It is my opinion that in these cases the infection is already present in the soft tissue of the bone either having gained access to the bone through destructive dental infection or through some outside agency and that the removal of the tooth is usually a sequence of this disease and not a cause.

Where osteomyelitis is progressing in a young jaw, or older jaw for that matter, there is usually a considerable amount of pain and swelling about the face such as would direct the attention to the teeth. In many cases, the teeth are loosened in the inflammed area and to the inexperienced eye, a diagnosis of the alveolar abscess is indicated. An X-ray picture will usually show the difference very quickly.

Where the periosteum alone has been attacked, you can nearly always see a light cloud in the X-ray at the margin of the bone. This is in the raised free margin of the periosteum that has been forced away from its proper contact with the bone. Where the bone itself is infected a mottled effect is usually seen. It is very important to make a diagnosis of osteomyelitis before any surgical interference such as extraction is attempted, because this disease is frequently fatal in children and explanations are difficult to make.

Clinical Cases

S. H., female, age four, white, admitted to hospital February 7, 1921, with a history of swelling on both sides of the mandible and the anterior triangle of the neck over a period of eight weeks following the extraction of all of the temporary teeth from the right lower second temporary molar to the left lower cuspid. An incision over the mandible was made and the upper margin of the body of the mandible was removed without any bleeding whatsoever. An exploration was made into the crypt of one of the permanent teeth and the tooth was found surrounded by pus. Several of the permanent teeth were evacuated from their crypts because of the death of the surrounding bone. The patient did not bleed from any exposed bone surface, either during or after the operation. As much dead bone as was considered safe was cleared away without removing the entire body of the mandible. It was impossible to remove all of the dead bone. Irrigation with three per cent argyrol and a pack of iodoform gauze was continued for some weeks. The patient's general health improved and she suffered very little pain but the swelling did not subside. She was again placed

upon the table and some more dead bone was removed without breaking the continuity of the mandible. The periosteum, however, had become so detached that by taking hold of the lower lip and pressing down slightly, the entire body of the mandible was exposed with no periosteum upon it whatever. This piece of dead bone was left in place in the hope that it might serve as a matrix for a regeneration of a part or all of the lower jaw. The X-ray pictures indicate that such a regeneration is occurring and an expectant treatment has been adopted; keeping the area as clean as possible, removing dead bone fragments, opening and draining abscess pockets as they are found, and intensive feeding. This treatment is keeping the child alive and there is yet some hope that nature will regenerate this jaw to a very considerable extent.

D. S., age forty-five, white, female, was admitted to the hospital April 17, 1922 and discharged April 26, 1922. She had already been three weeks in a hospital following an operation for osteomyelitis of the mandible but after the operation a sinus developed, discharging pus on the under side of the jaw. This kept up for some months before she came to my clinic. The reason for this continuation of infection is shown very plainly in the radiograph and upon the sufficiently large to introduce the finger removal of the necrosed root, an opening was found extending entirely through the body of the mandible. A considerable area of necrotic bone was removed, leaving only sufficient healthy bone to prevent a pathological fracture. A rubber tube drainage was inserted and in nine days she left the hospital; one week later her wound was entirely healed. This case would be considered the carious sequence of an osteomyelitis.

M. H. D., five years, female, white, was admitted to the hospital January 14, 1922 for swelling on the right side of the mandible occurring eight weeks ago when her dentist extracted a left lower second temporary molar without relief. There was a discharge of pus on the alveolar ridge and a very large collection of pus in the region of the sub-maxillary gland on the left side. She had been previously unusually healthy. An incision was made in the molar region of the left side and the periosteum found raised from the second molar to the cuspid left. The crypt of the permanent first biscuspid was invaded to such an extent that the removal of the developing bicuspid was necessary. The dead bone was curetted and the rubber tube drain placed and the wound packed with iodoform gauze. She was discharged January 22, 1922 and a short time thereafter another small sequestra developed; upon the removal of this, the entire wound healed very rapidly with practically no scar.

M. O., age five, white, male, admitted with acute osteomyelitis in the right mandible February 2, 1922, discharged February 6, 1922. Since October 22, when he had a temporary tooth extracted from the right lower jaw, he had a very considerable swelling with practically no pain. The face swelled immediately after the extraction of the tooth and never changed in size. The radiograph indicates a destructive inflammation of the right side of the body of the mandible to such an extent that a radical operation would have been necessary. The parents insisted that this was simply a case of extraction and that there could be no serious complications unless the operator caused it. Consequently, the child was dismissed without the operation. This case is cited along with the others to show that at about the age of five or six years, acute destructive osteomyelitis is likely to occur in children.

E. S., age fifteen, female, white, admitted April 8, 1921, discharged May 1, 1921. Had a large swelling in roof of the mouth. About twelve days previous, had developed a toothache. Face on the right side anterior became swollen. This was a case of extensive infection of the

right upper lateral, which invaded the palatal area and caused extensive destruction of the bone of the roof of the mouth. The right upper lateral was extracted, a large granuloma removed, the palatal mucoperiosteum opened and a considerable amount of dead bone removed. The palate was sutured and the wound packed with iodoform gauze from the opening through the tooth socket. Her recovery was rather rapid and the result satisfactory.

M. D., age nine, white, female, admitted July 27, 1921, discharged July 29, 1921, abcess discharging lower quarter left mandible from interior first molar. Duration of abscess eighteen months, tooth removed six weeks previous. The incision was made at the lower border of the mandible and the hyperplastic tissue in considerable quantity was excised. The necrosed area was curetted and the diseased periosteum removed. The skin was undercut and a flap of muscle and fat was turned over the bone edge to form a cushion and prevent the adhesion of the skin wound to the bone. This was successful and the scar left was very slight.

The greatest cause of osteomyelitis of the jaws is extension of infection from the teeth. Every alveolar abscess and every case of pyorrhea is, to a greater or less extent, osteomyelitis. We use the term, however, when the disease has progressed to such an extent that the removal of the tooth will not cure the inflammation so that in a true osteomyelitis, from a clinical standpoint, we must have sufficient infection in the bone substance to have the disease continue in full force without the presence of septic teeth. This does not mean that osteomyelitis does not exist with all of the teeth in place, but is merely an effort to differentiate between a purely dental and purely surgical manifestation.

So-called dry sockets remaining after the extraction of teeth are cases of localized osteomyelitis and should be recognized as such. Treatment of osteomyelitis consists of first, incision, evacuation of pus, removal of all dead and hopelessly injured tissue and the establishment of drainage. Second, rest for the patient, preferably in bed; careful attention to nutrition and elimination plus irrigation.

These cases usually heal slowly, and where periosteum is very considerably involved, swelling will continue over a very long period. In all cases of osteomyelitis, it is necessary to be a little more radical than conservative. Incisions should always be made where the scar will be least conspicuous and should be so extensive that all of the infected bone area is exposed to view. Where I use rubber tube drainage, the tube is removed upon the third day. In those cases in which iodoform packing is used to prevent exposure of the wound, the period over which such packing is continued varies with each case and will be discontinued whenever the operator sees fit to allow the wound to close.

The complications of osteomyelitis of the jaws are infection of the sub-maxillary, sub-lingual, parotid glands, pathological fracture and metastasis which may involve the heart, kidneys or any other of the vital organs. Osteomyelitis does not tend to recovery, but if neglected, usually becomes a chronic destructive suppuration. The bacteria most commonly associated with this disease are staphylococcus, streptococcus and pneumococcus, bacillus typhosis, bacillus coli communis and bacillus tuberculosis.

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Discussion

E. F. Tholen, Los Angeles, California: I would like to ask Dr. McGee whether he extracts, in osteomyelitis, the teeth that are etiological factors in the process or in-

volved in the process. Very often the first molar will start osteomyelitis and then the second molar or the bicuspids will become infected, or vice-versa. I would also like to ask him if he drains the mandible in fractures. All fractures in mandible are practically compound (fractures in front of the mandible) and in my experience with these in the mandibular I generally drain them immediately—this isn't original—because I find the patients are much better if I do, suffer less from the swelling and acute inflammation that invariably comes on in these cases.

Dr. McGee spoke about dry sockets. I believe, if I understood him correctly, that he said co-called dry sockets remaining after the extraction of teeth are cases of localized osteomyelitis and should be recognized as such, and I think he is right. I wonder, too, if anyone ever had any experience in removing the dry sockets. In dry sockets the patients have all suffered a great deal, from two to four, even six weeks, using the very best methods, and at most we can give them only temporary relief. I wondered if one were to remove the wall of the socket whether it wouldn't relieve the tension and give them relief better, because, as a rule, in the dry sockets a part of the wall comes away. I realize in doing that you might start secondary infection.

Harry Tuckey, San Francisco, California: I would like to know whether or not any one has seen a case of exostosis involving the gingival margin. We do not find it so; our injury is usually at the apical third. Those who have had experience know what it means to chisel out these teeth because often that is the only way we can get them. Is there pericementum existing between that root and the jaw bone?

S. B. Fontaine, Oakland, California: One thing Dr. McGee did not mention in the etiology of osteomyelitis was the use of the hypodermic needle as a possible factor. Though the cases that come to the oral surgeon may not have been primarily caused by the extraction of teeth, I do believe that the injection with hypodermic into infected tissue has at least started the flame.

I believe the reason for the extensive and rapid progress of osteomyelitis of the jaws in children, is due to the teeth. The little jaws are just packed with deciduous and permanent teeth and have little medullary space. You may recall an X-ray in which the permanent teeth are located near the lower border of the jaw extending upward to the deciduous roots almost touching them. These cases have a lack of resistance due to improper blood supply and impair the combat of infection in bone.

I would like to ask Dr. McGee if he has determined the etiology of the case of the first girl. Were the teeth removed under local anaesthesia or nitrous oxid? Has there been a tendency to exfoliation or sequestration of the bone?

N. L. Zimmerman, Portland, Oregon: Many of these cases come to the oral surgeon from the general practitioner, who has been under the impression that they are of only minor importance, and regards them as alveolar infections which will clear up without much treatment. As a result many of these cases do not get proper attention until extensive destruction has taken place. It should be impressed upon the profession that these cases should be handled quickly for the destruction is rapid after it has once started.

Another point that might be stressed a little more is the matter of correct diagnosis. There is an opportunity presented at times to make a mistake in the diagnosis of a true osteomyelitis and a true cystic condition. A careful history of the case and clear X-ray findings will usually guide the operator in his course of treatments.

Arthur E. Smith, Chicago, Illinois: Osteomyelitis, ostitis and periostitis are due to traumatism and infection. When we have a suppurative condition following the removal of teeth we should step lightly with curettement for fear of spreading the infection. The term ostitis should be employed instead of osteomyelitis when applied to the upper or lower jaw. This condition results from infection either from microorganisms from the blood, from local infections or from a pre-existing periostitis. Following the removal of teeth ostitis may follow due to periostitis or from infection through the tooth socket. The progress of infectious invasion may be arrested in the acute stage if the proper treatment is instigated.

Two cases came under my observation recently, and a brief discussion of them may be of interest. A patient of fifty had his lower right third molar removed which was rapidly followed by acute suppuration. The patient returned to his dentist for relief and the dentist removed several teeth which were located within the suppurating zone. The infection spread rapidly and the patient returned to his dentist the third time with the result that all teeth in the lower jaw were removed. In about six or seven days following the removal of the teeth the entire lower arch was involved from the right to left lower third molars. When the patient was referred to me he had a temperature of 103, very anemic, with a bounding pulse, high

blood pressure and ankylosis of the mandible. Local anesthesia was not permissible. Nitrous oxid-oxygen anesthesia was employed and the jaws were opened with caution. The process was exposed from the third molar on the right to the third molar on the left. This was done to establish free drainage. Iodoform gauze was packed loosely into the wound to keep it open. No curetting was done. The pack was changed three times daily and a freshly prepared Dakin's solution was liberally employed. Six days following, X-ray pictures were made which showed extensive involvement of the process. In twelve days the patient was operated and careful curettage was done under ether and several sequestra were removed. We should not curette in acute ostitis for fear of causing a dissemination of infection and the possibility of removing process or bone which nature would regenerate. The patient was operated a second time and parts of process and bone as large as my thumb were removed. Six days following the second operation, the patient, due to his lowered physical condition developed lobar pneumonia and was at the point of death for several days. Following the pneumonia he developed empyema which necessitated a rib resection for the removal of over a quart of pus from the pleural cavity. I am of the opinion, had the dentist established free drainage after the removal of the first tooth, the suppuration would have been arrested. At it was, the patient was in the hospital six weeks and came near losing his life.

The second case was a woman twenty years of age who consulted a physician in a small country village for the removal of the lower left third molar. The tooth had been aching for several days. The physician did not remove the tooth, but advised her to apply hot antiphlogistin to the jaw. The patient obeyed orders. The antiphlogistin was applied which resulted in the formation of an external fistula. The tooth was then removed by the physician which was rapidly followed by acute suppurative ostitis. The patient was placed in the hospital and ample drainage established. General treatment was given, a drain was inserted and correct antiseptic measures were employed. The patient lost a large section of her jaw and in addition an ugly scar resulted due to the external fistula.

I hope no operator will ever be guilty of inserting a needle into inflamed or infected tissue such as we encounter in periostitis, ostitis and osteomyelitis. Such a procedure is wrong, unscientific and dangerous. The extra oral method of blocking, ether or nitrous oxid-oxygen anesthesia should be employed.

Great care should be taken after the removal of teeth to see that the wound or socket is surgically clean. This subject demands a great deal of care, consideration and study in order to obtain the best postoperative results. In closing I wish to state that the three cardinal points to remember in the treatment of acute suppurative ostitis are ample drainage, liberal use of efficient antiseptics and to not curette until the X-ray reveals the formation of a sequestrum.

Boyd S. Gardner, Rochester, Minnesota: The treatment of dry sockets is more or less of a problem for every dentist. Surgical interference is without a doubt contraindicated in the acute condition. Palliative treatment in the form of powdered novocain incorporated into sterile vaseline and applied to the socket has been found to be very advantageous in relieving pain in severe cases. It may be necessary to repeat in twenty-four to forty-eight hours, yet it will relieve the patient.

Joseph P. Henahan, Cleveland, Ohio: The effects of the different changes which take place in the jaws and throughout the system and which arise from infected teeth have been so forcefully shown that dentists all are aware today of the potentialities which accompany the operation of extraction, when infection exists. Extraction has been done many times by dentists where, as in the case to which Dr. McGee has referred, no pronounced symptoms existed to warn the dentist. I am sure many of us have seen cases of that kind. Warnings cannot come too often. I believe the time has arrived when the dentist, not only for his own welfare but because he owes it to every patient for whom he performs the slightest operation, to see that his procedure is thorough and complete.

In performing the operation of extraction all the care indicated for any surgical procedure should be exercised. If the operation is for the relief of odontalgia then our troubles are very simple, but if we are removing the teeth because of infection, we should not consider the danger as passed. In reality the extraction of a tooth in a pus case amounts to making an incision for drainage and removing the cause of the disturbance at one and the same time. Now, whenever surgery demands drainage, the surgeon keeps the incision open long enough to allow the condition to clear up, and the skillful dentist will treat the alveolar wound the same way. In removing a tooth, therefore, we should regard it as an incision and not necessarily a final operation. In bad suppurative conditions remove the tooth and maintain drainage, leaving curettage or other radical steps for a later time.

I believe the old surgical rule is the wisest

one to follow: to wait until the dead bone fragment has adjusted itself so that it is ready to be cast off. When at this stage its passage outward is obstructed by soft tissues, incision is necessary to make the opening large enough to allow the fragment to pass out easily, which it always will do.

I believe we all should pay strict attention to the method of removal of particular infections at the apex of the tooth and avoid breaking through the protecting bone wall established by nature.

S. L. Silverman, Atlanta, Georgia: I was very much interested to hear that the average case of osteomyelitis is found in the very young. What interests me in particular is, what is the etiology? As a rule is it not the attending dentist or physician?

When the attending dentist or physician allows a simple jaw infection to attain an aggravated stage he is often to blame for extensive osteomyelitis. The proper procedure in infections around teeth or jaws, whether such infection follows extraction or not, is to lance and establish drainage. Lance intraorally in the early stages and extra-orally in the later stages. If you will examine the case records recited by Drs. McGee and Smith you will find that extraction of one tooth after another was resorted to in order to stay the spreading infection. But the case records fail to show that *early* incision, liberally and wide, was instituted. If you incise to the bone at the most pendent portion, even though very little or no pus be present, you will have less cases of osteomyelitis to record.

C. H. Dubois, San Rafael, California: Instead of surgical interference, we should often try healing our dry sockets by using fifty per cent of sulphuric acid, or strong iodin to disinfect the dead bone, allowing nature to slough it off. We must see that the general health and diet of the patient are taken care of as that has a great bearing on the response of the system in healing the wound.

A. T. Rasmussen, La Crosse, Wisconsin: The point Dr. McGee brought out of infection being present before operation was performed, resulting in a serious case of osteomyelitis, is especially well taken. I believe that in a great many cases where osteomyelitis follows a more or less serious bone operation, the infection was present before the operation was performed. In fact the operation is usually deemed necessary to relieve a condition caused by the presence of a pathological microorganism. The operation failing to relieve the condition, the pathology becomes more apparent and is then recognized as a case of osteomyelitis.

If the surgeon (I use the term to include the dentist) will keep in mind that all infections in and about the bones are potential cases of osteomyelitis there will be less trouble in this respect.

There is no more justification for dismissing a patient without further attention, after removing a tooth or other operation upon the bones of the jaws than there is in so doing after amputation of some other member. Every surgical wound should be watched carefully until danger of infections is passed This includes the wound left after removal of one or more teeth whether done by the so-called surgical method or otherwise.

Dr. McGee (closing): Dr. Tholen asked a question that occurs to me very frequently and that is, when do you extract in osteomyelitis? I extract in osteomyelitis whenever I am thoroughly convinced that the involved teeth are so hopeless that they cannot be saved.

Sometimes we think that we have extracted all the teeth necessary but after we do that back comes our infection, then we remove some more. In these cases of osteomyelitis the best thing to do is to warn the patient at the start that while you hope you can finish in one operation, the chances are that there will be more or less surgical interference on two or three occasions subsequent to your original operation. It is better to tell him than to have him believe you are going to perform a miracle and then fail.

If suppuration is present or it looks as if suppuration is bound to be present in mandibular fracture I make an incision and put in drainage. Of course a few cases of mandibular fracture occur where drainage is not necessary. But the slightest indication of suppuration at the point of fracture should always be followed by drainage. The least interference you do in the curettage of dry sockets the better; if you could use emollients to keep the patient quiet, why, all right, well and good, for if you interfere it will be necessary to make the incision, remove the outer wall of the alveolus and carefully curette the bottom of the socket.

I had a suggestion from Dr. Henahan in the use of Dentalone as a packing. He suggested that this would subdue pain very nicely, and I agree with him.

Dr. Tuckey asked whether any one has ever seen a case of exostosis involving the gingival margin. I answer yes.

In the closure of wounds, in osteomyelitis it is necessary to drain, consequently, complete closure will be contraindicated. If a wide open drainage is made, pack it open. As far as closing the wound is concerned, that is absolutely contraindicated and his remarks

are quite correct to the effect that we should maintain an open wound. Brilliant green and crystal violet were tried out by Dr. Tuckey and his associates at the University of California for some time. He told me about that two years ago and for your information I will say that it is brilliant green and crystal violet. I have used them very widely since he suggested it and I am very much pleased with the action of the combined fixation stain. It is a liquid of a bluish appearance, looks just like fountain pen ink, and for that reason for some purposes it is undesirable but still it is a splendid antiseptic, in cases where you do not want the irritation that sometimes accompanies the use of iodin. I have had one or two cases of osteomyelitis that seemed to show very highly beneficial results from the use of it; in others I secured good results while in some cases I used Colloidal silver, but I am partial to brilliant green and crystal violet.

Dr. Fontaine of Oakland, California, spoke of the hypodermic as a factor in the causation of osteomyelitis. I do not believe it is. The little girl I told you about that interested me so much and must have interested you had practically a total destruction of the mandible; she was a nitrous oxid anesthesia case; and the little boy was strictly a nitrous oxid case. I do not doubt for the moment that dirty instruments and all that sort of thing have most widespread results, but I do not believe that many men are careless any more. With clean instruments and proper preparation one would not be likely to produce osteomyelitis. Osteomyelitis is the destructive inflammation of the soft part of the bone. The bone is very resistant tissue, it is not very much exposed to infection. The mere smearing of infection upon the bone does not infect, you must injure the bone first and you must then produce bacteria which will grow in that unfavorable environment. Whenever you have a bone infection you will find a very virulent infection that is going to destroy the hardest tissue in the body, and nature realizing it is a difficult thing to build makes it also slow in its destruction. I believe all these infections exist a long time before we ever have any knowledge of them. I think we also always get in on osteomyelitis long after the disease has developed, and therefore I do not think the use of hypodermic is going to produce the osteomyelitis. The sequestration idea is perfectly correct. I do not think we ever detach a sequestrum, we let it detach itself, then remove it. The curetting must be properly done. This matter of scraping must be done with judgment.

I entirely agree with Dr. Zimmerman's suggestion that very often we are too late. And that is true. We too often recognize an osteomyelitis after it is pretty well developed. In mild stages it has been recognized for a long period, and I do not think that we have very rapid cases, except in a child. As a matter of fact, I do not think that we could stop them if we did recognize them earlier. I think they have to run their course after they get started.

Now, as to the difference between osteomyelitis and a large cyst, that is a matter of reading your X-ray, but it would not be a very great mistake if what you thought was osteomyelitis happened to be a cyst. After you get your X-ray you are going to do the surgery that lies before you. Whatever you do after you make the opening, the main thing is to decide whether you should go in to some particular spot; you should take everything away that requires removal and leave everything that should be left, and leave the wound clean so it will be ready to heal.

There is nothing more dangerous than these blind curettings. We should absolutely get away from them and discourage them, yet we should recognize that nobody could get along without a curette; if you have diseased tissue down there, how are you going to get it out if you do not curette it? Once in a while we get a new set of instruments and they look attractive to us and we get some new idea and start using that new instrument, but sooner or later we become more conservative and find that it is not good policy to scrape so much. It is true when we first had those things there was that inclination. I know in my case I found that it led to trouble and I quit, and I think all the rest of you have had a similar experience.

Some one mentioned pneumonia and empyema; that happens; we do not like it. Whenever you are dealing with pus you have danger of infection.

You have to do something in a bad case of osteomyelitis. Some argue against not considering the work finished in the first operation. Now, that is correct. They will clear up in the first operation perhaps but there is something additional to be done; possibly several minor follow-up operations.

I do not agree with Dr. Silverman in his contention that the dentist and the physician are to blame. I do not know who is to blame. The truth of the matter is that the infection is there but we do not know how it gets there. We use every effort we can to eradicate it after it gets there and do everything we can for the patient.

THE CARE OF CHILDREN'S TEETH FROM THE VIEWPOINT OF AN ORTHODONTIST

By CHARLES R. BAKER, D.D.S., Evanston, Illinois

(Read before the Chicago Dental Society, May 16, 1922)

I WISH to emphasize a few principles and offer a few suggestions that I believe should be recognized and considered by the general practitioner of dentistry.

I will assume that in the discussion of children's teeth we are expected to consider the mouths of patients from the time of the eruption of the deciduous teeth, continuing through the period of rapid development of the jaws, until the deciduous teeth have been replaced by their permanent successors and the second molars have assumed their positions in the dental arches, at which time the patients are usually about twelve years of age.

A study should be made of the normal growth and development of the jaws and the eruption of the teeth. Patients should be examined carefully at regular intervals of not more than three months and an accurate record made of each case. Such examinations should include observation of the general shape and width of the dental arches, the arrangement of the teeth in each separate arch, and finally the occlusion, noting particularly the relation of the upper and lower jaws. In many cases it is advisable to take impressions and make casts from time to time in order to record the conditions accurately.

Minor irregularities in the alignment of the deciduous teeth usually do not exert much influence upon the positions of their permanent successors but if the jaw relation is abnormal, or if the dental arches are of insufficient width, the permanent teeth are rarely, if ever, able to assume their normal positions. At the age of four years the deciduous anterior teeth should begin to separate in order to insure sufficient space between the deciduous cuspids for the normal eruption of the permanent incisors.

Careful inquiry should be made as to the habits of the patient, such as abnormal respiration, thumb-sucking and lip and tongue biting. These habits produce abnormal muscular pressure upon the developing jaws. Muscular pressure is probably the most important influence upon the growth and shape of the jaws.

The fraenum labiorum is occasionally abnormal in size or attachment and produces a space between the central incisors. There is at present considerable variation of opinion as to whether this tissue should be removed or not, some claiming that it will be absorbed if the incisors are placed in normal positions and properly retained. I think it is rarely advisable to interfere with it where the deciduous teeth only are in-

volved for in some cases an adjustment to the normal occurs coincident with the exchange of the deciduous for permanent teeth. However, when it is decided proper to remove this tissue from between the permanent central incisors, plans should be made to move the teeth as soon as possible after the operation, before sufficient scar tissue forms to interfere with such procedure and possibly prevent a satisfactory result.

When deciduous, or permanent, teeth require proximal fillings, these fillings should always restore the normal contour and mesiodistal width of the teeth. I recently had the opportunity of measuring a permanent upper first molar before and after filling. The normal mesiodistal width of this tooth was 9.2 mm., and after filling, 10.8 mm., a discrepancy of 1.6 mm. In this particular mouth, there was a supernumerary tooth in the upper incisor region which also helped to crowd the arch. Normal occlusion is not possible where the normal shapes and sizes of the teeth are not maintained.

Proximal amalgam fillings are frequently seen that were placed without the use of a matrix, with a considerable amount of the filling material pressed into the soft tissues between the teeth, causing irritation and inflammation. Occasionally, two proximal cavities in adjoining teeth are filled with one amalgam filling, which is very poor practice.

In the placing of a filling which includes any portion of the occluding surface of a permanent tooth, the operator should use every effort to restore the normal size and arrangement of cusps, grooves and inclined planes of the occlusal surface. In some cases it is advisable, after orthodontic treatment, to have fillings removed and replaced with fillings that adequately fulfill the requirements of normal occlusion.

Normal occlusion is of paramount importance to every individual and in the daily practice of every branch of our profession we should always consider seriously such important influences as: the shape of the dental arches, mesiodistal widths and proximal contact of the teeth, the fitting of the cusps and inclined planes and the overbite of the anterior teeth.

We should also recognize the fact that many patients do not have the normal complement of teeth, due to congenitally missing teeth and supernumerary teeth. The following report of 262 cases may be of interest. In these cases skiagraphs covered all regions of the mouth anterior to the permanent second molars in which the permanent teeth had not erupted; in some cases the permanent second molar region was also included. No record was kept of third molars. It is possible, however, that additional supernumerary teeth were present and not discovered.

TEETH CONGENITALLY ABSENT

UPPER

Right		*Left*
10	Lateral incisor	7
2	First bicuspid	2
11	Second bicuspid	11
1	Second molar	1
24		21

LOWER

1	Central incisor	2
1	Lateral incisor	1
23	Second bicuspid	22
1	Second molar	1
26		26

Upper teeth missing	45
Lower teeth missing	52
Total	97
Supernumerary teeth (upper)	10
Discrepancies in 262 cases	107

The number of teeth congenitally missing in an individual ranged from one to thirteen.

It is impossible to have or produce

normal occlusion if any of the teeth are missing and this point should be kept in mind if you are considering the extraction of a permanent tooth as part of the treatment of malocclusion. There are cases, of course, where it is advisable to extract a permanent tooth in a case of malocclusion, but these cases are not common and the decision should be made only after careful and thorough study of all the conditions, for the result can only be a compromise as far as occlusion is concerned. I believe it would be good practice to have skiagraphs of the entire mouth made of every child patient at about the age of six years in order to ascertain if the normal teeth are present and to plan for the proper treatment of cases in which the number of teeth is abnormal.

The subject of the exchange of the deciduous for permanent teeth cannot be properly discussed in this short paper but I do want to emphasize the idea that both the upper and lower dental arches must develop harmoniously if the result is to be normal occlusion. While it is very important to have a normal arrangement of the teeth in each individual dental arch, the really vital factor is the occlusion, or the manner in which the teeth of both upper and lower jaws function during mastication. To make possible normal occlusion, it is essential that the upper and lower jaws develop uniformly and the deciduous molar region is especially important in this development. This is true principally on account of the discrepancy in mesiodistal widths of the deciduous molars and their successors, the bicuspids, and because these teeth occupy a position between two regions of permanent teeth and well developed bone areas. The corresponding upper and lower deciduous molars, on the same side of the mouth, must be lost at approximately the same time if the result is to be normal. If the patient has a deciduous molar in one jaw and a corresponding bicuspid in the other jaw, there will be a discrepancy in the mesiodistal widths of these teeth which will prevent a normal occlusion of some of the other teeth. This suggests the extraction of deciduous molars. Usually, the age of the patient need not be considered owing to the great variability of different individuals. In cases of normal arch relationship when a lower bicuspid erupts and assumes its place in the arch, the corresponding upper deciduous molar should be removed.

In the extraction of a deciduous tooth, care should be taken not to interfere with the permanent successor; this is particularly true in the removal of a deciduous molar. It is also important that the entire deciduous tooth be removed, for sometimes a small portion of a deciduous root is left in the tissues which may cause a permanent tooth to erupt in an abnormal position. In some cases it would seem advisable to make use of the X-ray after extraction, to determine whether or not all of the tooth had been removed.

When a deciduous tooth has been prematurely lost, the proper space should be maintained in the arch. By *premature loss* is meant the loss of a deciduous tooth so early in the development of the individual that malocclusion will result unless there is orthodontic treatment. When deciduous incisors or cuspids are prematurely lost, it is usually necessary to develop the anterior portion of the arch by orthodontic treatment. When deciduous molars are prematurely lost, the proper space can usually be maintained or developed by means of a simple appliance by the general practitioner. In case a deciduous molar is prematurely lost, the space to be main-

tained should be the mesiodistal width of the lost molar instead of the mesiodistal width of the bicuspid that is to erupt later, in order to harmonize with the size of the corresponding deciduous molar in the opposite jaw. It is of much greater importance to maintain the normal mesiodistal space in the lower than in the upper jaw. If a lower deciduous molar is prematurely lost, the result is a lack of pressure to encourage the forward development of the anterior teeth, and there is also considerable probability, due to loss of proximal contact, that the posterior teeth will move mesially and assume an abnormal inclination. When an upper deciduous molar is lost, there is not the lack of development in the region of the upper anterior teeth because these teeth are to the labial of and overhang the lower teeth. And usually there is not the same tendency of the upper posterior teeth to move mesially, which may be due to the occlusion or to the manner in which the development of the upper teeth and jaw takes place.

A simple appliance for maintaining space in cases where deciduous molars have been prematurely lost, consists of plain bands or shell crowns (seamless), to fit the proximating teeth, connected with a plain, soldered wire. If desired, the wire may be lengthened by the use of special pliers. If it is necessary to increase the space considerably, a small jackscrew may be substituted for the plain wire. Some men prefer the use of only one band or crown, with a wire extending to and resting against the other tooth, but this plan has not been entirely satisfactory in my own practice. Whatever appliance is used, it should be designed with the idea of interfering as little as possible with the physiological development of the jaws.

The premature loss of a deciduous cuspid is a serious matter and every effort should be made to keep this tooth in normal position until the proper time for its loss.

There seems to be, in the minds of many general practitioners, an idea that orthodontic treatment should be delayed as much as possible in order to "let nature correct the abnormal conditions." Let me emphasize the value of an early, careful, thorough examination and diagnosis, because early treatment is so frequently necessary, instead of waiting until the conditions are so abnormal that long treatment is required, and in some cases, a normal result impossible.

Correcting malocclusion in deciduous dentures is extremely important in cases where the jaw relation is abnormal. The best time for such treatment is between the ages of three and four and one-half years, after the deciduous roots have attained their full development and before much absorption has occurred. The movement of deciduous teeth after considerable absorption of their roots has taken place probably does not exert much influence upon the development of the arches or positions of the permanent teeth.

Remember that as long as the dental arches are developing abnormally, all of the other tissues of the lower portion of the face and of the neck are growing to fit the abnormal jaws. Early treatment is therefore necessary in order to assist the jaws to develop normally and to insure more permanent and satisfactory results. It is true that in some cases it may seem advisable to wait a short time after the abnormal condition is noticed before instituting treatment, but this problem should be solved by the operator who is to treat the case.

As a summary of the above, let me offer the following suggestions: Study carefully the normal development of the

jaws and the eruption and arrangement of the teeth. Examine thoroughly the mouths of children at frequent intervals, keeping accurate records. Look for spaces between the deciduous incisors when the patient is about four years of age. Make inquiry as to habits of patient which may cause malocclusion. In placing fillings, restore the normal size and contour of teeth. Recognize the fact that many teeth are congenitally missing and that supernumerary teeth are not rare. Make liberal use of the X-ray in diagnosis. Endeavor to assist the upper and lower arches to develop harmoniously. Be thorough in the extraction of deciduous teeth. Maintain the correct space in cases where deciduous teeth are prematurely lost. When abnormal conditions are present, do not advise patients to wait until nature corrects the case.

In closing, allow me to take the liberty of suggesting that no ideas be offered the patient relative to the proper appliances or method of procedure in his case. It is much better to refer the patient to an orthodontist in whom you have confidence and let him use his best judgment in the entire matter.

The length of orthodontic treatment required and the results obtained depend in a great measure upon the number of months or years of abnormal growth and development.

The orthodontist is interested primarily in producing a normal, efficient chewing apparatus and the appearance of the patient is of secondary importance. The proper mastication of food is one of the most important, fundamental factors concerned in the normal health of the individual. Eliminating possible systemic abnormal functional influences, if the teeth are placed in normal arrangement and occlusion during the age of rapid development of the jaws, the patient will usually be normal in appearance.

THE CHEMISTRY OF THE DENTIFRICE PROBLEM

By CARL PFANSTIEHL, Highland Park, Illinois

(Read before the Lake County Dental Society, Waukegan, Illinois, January 2, 1923)

THE tremendous importance of human diet and the dearth of exact biochemical knowledge concerning it was made vividly apparent by the Great War. The tragedy lies not only in the actual loss of life but in the thousands of young children whose lives will go on though stunted in body and soul as a result of months of insufficient or incorrect nourishment. Is this not a challenge as well as an opportunity to bring about a closer co-operation between the physician, dentist and biological chemist? And does not this challenge extend also to the man who is not himself skilled in the art of healing or the unveiling of nature's secrets, but who through other talents or accident of birth, has become the master of wealth and therefore able by a stroke of his pen to release the genius and full time energy of the research scientist towards a solution of the problem?

The fact that our modern dietetic habits are far from what nature intended them to be is now recognized as a basic cause of the deplorable condition of the teeth of our most civilized nations. Until quite recently more intelligent interest was displayed in the breeding and feeding of cattle than in the welfare of the bodies of our children. The alarming prevalence of dental caries in children of pre-school age is part of the price we have paid for this neglect. The high immunity to caries of many uncivilized or "natural" races has often been observed. The incidence of caries in the Maori race is said to be not over 1.2 per cent (1a), yet there is no evidence that these savages ever practiced cleaning the teeth by any artificial means.

While the use of a toothbrush with a dentifrice for the purpose of cleaning the teeth might be considered "unnatural," it certainly has become very necessary as a *palliative*, and as such, everything possible should be done to improve its effectiveness and encourage its practice, but the cause and cure of dental caries will not be found in mouth hygiene alone.

The so-called "amino acids" have not been popularized as have the vitamins (2), and therefore their tremendous importance and relation to the problems of growth and health is not generally known. These compounds, about sixteen in number, are the cleavage products of proteins, and quite recently the more important of them have been isolated in chemically pure form and in quantities sufficient for research work (3). A molecule of one kind of protein differs from a molecule of another principally in the number and proportions of the amino acids of which the highly complicated protein molecule is built up. A protein, the white of egg for instance, if introduced directly into the blood stream acts as a definite poison, but when it passes through the digestive tract it is split up into its several constituent parts, the amino acids. These definite but delicate compounds are then taken up by the blood and carried throughout the body where they are selectively absorbed

by the different organs. The ability of the different parts of the body to *select* and *use* the particular amino acids needed, and the presence in the blood stream of the necessary amino acids in sufficient quantities, is very near the basis of the nutrition problem. For example: It has been shown by animal feeding experiments that cystine is particularly essential for the growth of hair. Small animals fed for a time on a diet substantially lacking in cystine soon showed signs of losing their hair, while others whose diet was enriched above normal in this amino acid developed an abnormal supply. Since human hair contains about twelve per cent of cystine this amino acid is best prepared from children's hair obtained from barber shops.

Cystine contains sulphur and is believed to be the only food substance capable of supplying this necessary inorganic element to the body in utilizable form (4).

Certain amino acids are absolutely essential for *growth,* particularly lysine, leucine, cystine and tryptophane, while others are indispensable for *maintenance.* The physiological difference is significant. The former process is to build new structures during the months before and immediately after birth when the blood stream of the mother supplies all the material, and later during the growing period of the child; the latter is merely to repair or replace worn out structure, and it continues and becomes the most important after the individual has attained full growth. The diet of the expectant mother as well as the growing child should be adjusted so as to insure an adequate supply of these necessary "building stones," as the amino acids have been aptly called. For illustration and to show the need of further research along this line, let us compare the amino acid content of mother's milk with cow's milk. The protein of mother's milk is relatively rich in lysine, leucine and tryptophane, all essential for growth, while cow's milk is relatively low in these substances and especially deficient in cystine. Consequently, when the latter is substituted for mother's milk, a larger quantity must be given in order to maintain an adequate supply of these indispensable amino acids. We know from experience that the protein intake must be cautiously doubled or even trebled when cow's milk is substituted for mother's milk. It follows that the other constituents of cow's milk will then be supplied to the infant in quantities greater than necessary or perhaps desirable. Why not make up the amino acid deficiency of cows' milk by adding directly to it just the proper amounts of the particular amino acids that are missing? Long and careful animal feeding experiments using pure amino acids must precede a correct answer to this question.

The amino acids having most to do with the formation of tooth structure have not been definitely determined, but it is safe to say that a deficiency of certain amino acids in the diet of the expectant mother is quite sure to result in a less resistant set of teeth for her child.

An important but little understood function of certain amino acids, which is shared with the vitamins, is to assist in getting into the blood stream in *proper* form for the ready assimilation and use by the body, various mineral elements necessary for tooth, bone and other body structures. Very little however, has been done on the exact biochemistry of this phase of the problem. Calcium and phosphorus of course are the principal mineral elements necessary for bone and tooth development. Phosphorus is quite generously supplied in many of the common foods, therefore a deficiency of this element is unlikely if an ordinary diet is taken, but this is not the case with calcium. Milk, eggs and green vegetables, particularly spinach, are the chief sources of calcium, athough the actual amount found in eggs and

vegetables is small. Milk is by far the most important source of calcium and it makes little difference for *this particular purpose* how it is taken, whether raw, skimmed, condensed or used in the preparation of other food. The mere inclusion in the diet of the necessary mineral elements as shown by chemical analysis, does not necessarily mean that they will be properly absorbed and used by the system. Little good is accomplished if they merely pass through the digestive tract unchanged. Recent observations have shown that fat plays an important part in calcium metabolism and that the best absorption of this mineral takes place when the diet includes fat, in amounts substantially equal to the protein content (4a). In addition to this and to its function in common with the carbohydrates as a source of energy, modern opinion assigns to fat a necessary part in nutrition principally as the carrier of the fat soluble vitamin shown to be essential for health and normal growth (5b).

Fuel or energy with which to run the human "engine" is supplied largely by the carbohydrates. The growing taste for sugar, which is undoubtedly being over-developed, and the concentrated form in which it is supplied, along with the comparative ease with which it is absorbed by the system, is doubtless responsible for the present excessive and ever-increasing per capita consumption. Sugar when taken into the system in excess of what is used or "burned" up in supplying energy tends to be stored in the body as potential energy in the form of excess and flabby flesh. Too much carbohydrate in the diet often leads to the use of too little fat and protein, and the added weight is due largely to excessive retention of water in the tissues of the body. Children of this type are particularly liable to disease and especially to dental caries. The greatly exploited but elusive vitamins are, doubtless, directly related to the amino acids and eventually may be found to consist of some sort of combination of certain amino acids.

The oral cavity must be considered in its rightful place as the very important beginning of the digestive tract. Our modern diet is in many respects far from what nature intended it to be. The mouth must do what it can, *with the odds against it,* to prepare the food for the stomach. It is as difficult to deal with chemically as would be a test tube with a hole in the bottom through which the contents were continually draining out while several streams of different fluids flowed in at the top, to say nothing of the conglomerate mass of stuff we dump into it three or more times a day!

The principal constituents of saliva are water, the alkaine salts of calcium and sodium, magnesium and calcium phosphates, potassium and sulphocyanate, sodium chloride, ptyalin, carbon dioxid and mucin partly in the form of mucinates. The principal function of ptyalin (salivary amylase) is to assist in the conversion of starch into sugar, maltose being the end product (6). Ptyalin is an enzyme and, it will be remembered that enzymes act very much as organic catalyzers. A catalyst is a substance which alters the velocity of a chemical reaction without undergoing any apparent physical or chemical change itself and without becoming a part of the products formed.

The conversion of starch into maltose is not a simple process as there are several intermediate products formed, erythro-dextrin and achroodextrin for example. The sticky, adhesive nature of dextrin is well known and, to quote Pickerill: "If the ptyalin be small in amount the conversion process will be a correspondingly slow one, the dextrin formed will remain longer, and this will tend to bind the substance closer and more firmly to the teeth" (1b).

A word now as to the nature of mucin. There are several forms of mucin all

closely related to each other and to the protein family. The sticky, tenacious material discharged from the nose particularly during a cold, is nasal mucin. Salivary mucin is a conjugated protein called glyco-protein (6). That is, a protein molecule united with a substance containing a carbohydrate group other than a nucleic acid. The exact formula is unknown. The complete function of the salivary mucin has not yet been determined, but in addition to its action as a general mouth lubricant, it is believed to undergo an alkaline decomposition in the presence of certain of the normal mouth organisms, thus becoming a protective agent tending to maintain the normal slight alkalinity of the saliva.

Salivary mucin as first formed in the glands is *not in the least sticky or adhesive.* The mucin molecule contains at least three separate atoms of hydrogen hitched to the rest of the complex structure, which is composed principally of oxygen, carbon, nitrogen and hydrogen. What happens to the mucin on its way to and after it reaches the mouth is this: *one, two, or more of these hydrogen atoms are replaced by basic elements such as sodium, calcium, etc.,* that are present in the mouth, and *mucinates* are formed. *These mucinates are sticky, adhesive and tenacious in proportion to the number of hydrogen atoms that have been replaced.* This substance, along with the dextrin products mentioned above, being insoluble in the mouth fluids, adheres firmly to all tooth surfaces and, with trapped food debris, bacteria, etc., constitutes what is known as mucin plaque or "film." Mucin plaque is an ideal culture media from both physical and chemical standpoints; a fact not overlooked by certain mouth bacteria notably the lactic acid bacillus. *Protected in this manner from the neutralizing power of saliva, fermentable food debris is slowly but surely converted into lactic acid, molecule by molecule and held for days or weeks against a single point or spot of enamel.* While the total amount of acid produced in one spot is small and could be neutralized by a few drops of saliva, *if it could be reached by it,* the concentration or actual strength of the acid *at that point* is steadily built up until it can and does attack the enamel. When the enamel is penetrated the reaction goes faster and finally the destructive work is taken up directly by the bacteria themselves. It would be interesting to know in exact figures to what degree this spot acidity is carried. Indirect experiments with the hydrogen ion apparatus indicate that in most cases it is comparatively high.

A word now as to the chemistry of dental calculus. Unremoved mucin plaque is doubtless the basis of tartar. When organic matter, particularly such a complex substance as mucin plaque, comes together under certain conditions with inorganic salts there is a tendency to retain the latter while the organic material, being less stable, undergoes various chemical and bacteriological changes and is not so readily retained. Carbon dioxid is often developed in the plaque by bacteriological action and aids in the precipitation of the mineral salts. The process probably is further aided, by the formation of various intermediate compounds. All this leads to the deposition on the teeth of the inorganic phase in hard, coherent masses bound together with a matrix of organic matter. So in time hard tartar is formed which may contain eighty per cent or more of inorganic matter most of which is calcium phosphate with some calcium carbonate, mucins, epithelial cells, and organic debris. Obviously the accumulation of these deposits is generally greatest upon the hidden surfaces and crevices between the teeth that are not ordinarily reached by the bristles of the toothbrush or the action of the tongue and lips. Dental caries invariably has its origin in such crevices, and it is recognized that the presence of calculus, or any other me-

chanical irritant, at or beyond the gum margins may be a cause of pyorrhea.

It has been observed that pyorrhea often develops in the mouths of persons having large strong teeth and bones (7). This is suggestive of a particularly active calcium metabolism which might also produce excessive quantities of calcium salts in the saliva in such form as to favor the development of calculus.

With this general idea of the chemical and physical nature of the pernicious deposit which forms, more or less, on even the best cared for teeth, let us see what can be done to remove it or better yet prevent its formation or at least its development. I hardly need to say that there is no easy way or panacea to guard the teeth against this particular enemy. Conditions both in the mouth and system differ greatly among individuals, but perhaps the greatest difficulty is in persuading or educating the individual, particularly the young child, to give the necessary time every day to the proper care of his teeth. Long experience has shown that dependence wholly upon abrasives or mechanical means for the daily care of the teeth is not only unsatisfactory but often dangerous.

The widely differing ingredients used in tooth powders and pastes, the variety of conflicting claims made for them by their makers and the generally unsatisfactory and occasionally harmful results obtained by their use, is suggestive of a lack of exact chemical and physical knowledge of the problem in hand or a willingness if not deliberate intention on the part of the maker to mislead the public (8 and 9). Many dentists are often misled or at least confused by the ever-increasing mass of advertised claims for dentifrices and the clever and misleading manner in which "authorities" are "quoted" and ingenious arguments built up often on false premises.

I shall not speak of the days in the near past when such abrasives as emery dust, pumice, cuttle bone, kieselgur, etc., were widely used in dentifrices. Their effectiveness in removing mucin plaque from exposed tooth surfaces cannot be denied, but unfortunately they are equally effective on the enamel as many people are bearing witness today.

Soap, the universal cleanser, has long been a principal ingredient of dentifrices. It effectively cleans the hands therefore it was assumed that it would clean the teeth and mouth as well. It has often been used in connection with harsh abrasives on the supposition that it would lubricate the abrasive and thus lessen its cutting action. While this may make the feeling in the mouth apparently less harsh the actual relief afforded is very questionable. Every machinist knows that when turning a piece of dense steel on the lathe, he must lubricate the cutting tool with oil or soap-water. The effect of the lubricant, besides cooling the tool, is to reduce the friction and crushing action and thus permit the tool to make a clean, sharp cut.

Natural chalk (calcium carbonate) crushed and sifted was commonly used until it was found to contain considerable amounts of very hard impurities. This led to the manufacture of a pure precipitated calcium carbonate which is used extensively today in pastes and powders having an alkaline reaction. When properly prepared under controlled conditions, precipitated chalk as ordinarily used in a dentifrice is harmless to the enamel. The general composition of this class of pastes is chalk twenty-five to fifty-five per cent; soap, ten to thirty-three per cent; glycerine, twenty-five to fifty per cent, (or oftener glycerite of starch which is more gummy and holds the chalk in suspension better); common sugar or glucose, up to ten per cent; alcohol, up to twenty per cent; saccharin and various essential oils such as eucalyptus, peppermint, wintergreen, cassia, cloves, etc., for flavoring and to mask the taste of the soap, up to five per cent; thymol, menthol, benzoic acid,

etc., as well as a long list of various drugs and germicides.

The doubtful effectiveness of precipitated chalk, or any abrasive that could be safely employed in a dentifrice, for the removal of mucin plaque particularly from crevices and between the teeth, led in part to the wave of medicated tooth pastes that have flooded the market. As well remarked at a recent meeting of a state dental society, "the manufacturers pick up new ideas from dental literature and place them in large type on their circulars as they have done with the acid or pepsin theory. They are just as apt to put something in print that will mislead the dentist as the public, and in this way derive a great deal of benefit financially from an unsuspecting public; in other words, they capitalize ideas that are founded on facts established by scientific investigation but their product which they advertise is oftentimes valueless" (10a).

The actual value of medicated tooth pastes as ordinarily used is very doubtful. A growing number of dentists are recommending the use of water alone or with ordinary table salt on the brush. Many lately however, are objecting to the use of salt on certain physiological grounds.

There is a growing objection to dentifrices containing drugs or other ingredients that might upset the digestion of a child if swallowed. Anyone observing a small child cleaning his teeth will notice that often a considerable quantity of the substance is swallowed. I have been told by a physician that several cases of severe poisoning have been traced to this cause. In discussing this subject with several pediatricians I found they were very definite as to certain things which should not be employed in a tooth paste intended for use by small children. For example, they condemn the use of drugs or medication of any sort, soap, essential oils in excess of one-fifth of one per cent, and many of the abrasives or fillers commonly employed. As to the drug potassium chlorate used as a filler to the extent of fifty per cent in certain widely advertised tooth pastes, the consensus of medical and dental opinion is to condemn its use in any form in the oral cavity on account of the ease with which it is absorbed by the oral mucous membrane, and its poisonous nature which tends to destroy the red blood corpuscles, particularly the haemoglobin (8 and 11). Potassium chlorate, as a chief constituent of certain tooth pastes, is advertised as a releaser of oxygen in the mouth. It is well known however, that this substance can release its oxygen only when strongly heated and never at body temperature or in the system (8 and 11). The cooling and somewhat agreeable sensation sometimes produced in the mouth by this drug, when used in the form of a dentifrice, is spurious and should not be taken as evidence of any beneficial effects.

The idea of preventing caries by "sterilizing the oral cavity," as is claimed for certain dentifrices when used in the ordinary way, is recognized as being impossible (8 and 10c). It would seem as easy to disinfect that part of the gutter which flows constantly past your house on a rainy day by throwing a handful of lime in it morning and night. When it is remembered that the mouth is a veritable hot bed of bacteria, most of which are benign and many actively beneficial, the wisdom of sterilizing the mouth, even if it were possible, would be very doubtful. Furthermore, the tendency of many drugs, essential oils and particularly antiseptics is to destroy the activity of ptyalin. This important point is too often neglected.

Alcohol used to the extent of twenty per cent in many pastes adds somewhat to the palatability but its actual value, if any, is doubtful. Since prohibition went into effect the denaturing formulae authorized for the pharmaceutical use of alcohol have been greatly stiffened. Special formula No. 31 authorized for use

in tooth pastes requires the maker of the alcohol to "add to every 100 gallons of ethyl alcohol 100 lbs. of glycerine U. S. P. and 100 lbs. of soap." No specifications as to the kind of soap are mentioned. If soap is to be used it should be the best grade of pure powdered castile soap to avoid harmful impurities. The alkalinity of all kinds of soap, however, is practically the same.

Consider now the effect of soap in the mouth and on the mucin plaque. Soap owes its general cleansing ability to two factors, one *chemical* and the other *physical.* Its alkaline reaction tends to dissolve by chemical action oily or greasy material. The physical action is due to the fact that soap, when stirred with water, forms one of the best and most active colloids known. Now a colloid is the suspension in a liquid of myriads of minute solid particles of ultra-microscopic size yet hundreds of times larger than molecules. These particles are always in a constant and violent state of motion, and in the case of soap they are believed to wiggle their way between and behind the specks of dirt and literally "bump" them loose. In this manner soap may assist somewhat in dislodging food particles from the crevices of the mouth provided its use is followed by a thorough rinsing with water. The claim is often made by the makers of a tooth paste containing more than twenty-five per cent soap that this substance is a necessary ingredient on account of its ability to emulsify oil. This would be more interesting if oil, or any chemically similar substance, were present in the mouth and a factor to be dealt with in the prevention of caries or general mouth hygiene. Furthermore, the saliva possesses ample emulsifying properties of its own as is easily demonstrated by taking a little oil into the mouth and agitating it with the tongue.

Soap when in use has a decidedly alkaline reaction. There is no such thing as a "neutral" soap despite the advertised statements of various soap bearing dentifrices. A widely advertised tooth paste containing a large proportion of so called "neutral" soap but *no water,* if squeezed out on a *dry* piece of red litmus paper does not immediately change its color. If there were an alkaline reaction the litmus would turn blue. The soap as contained in the paste, is inactive, just as a bar of hard, dry soap is before placing it in water. If a drop of water or saliva is added to the paste on the litmus paper the soap immediately becomes active (ionized) and therefore alkaline, and the litmus turns decidedly blue. The first instant this sort of paste meets the saliva in the mouth the soap becomes ionized and consequently alkaline.

The physical or colloidal action of soap, in the ordinary process of brushing the teeth, has little or no effect upon the viscid mucin plaque. The increased alkalinity of the liquids in the mouth during the time spent in brushing the teeth with a soapy dentifrice has, however, a *chemical* action on the plaque. Normal saliva is very slightly alkaline and in it, of course, the mucinates and plaque are stable. In a stronger alkaline medium, however, mucinates and mucin plaque if not too old become very slowly soluble. Strong alkalies act more rapidly but even then the reaction is not very fast. If one should agitate in the mouth an alkali much stronger than could be tolerated with comfort for several minutes continuously, the mucin plaque, if not too old, might be partially or completely dissolved. Obviously these conditions cannot be met in the ordinary routine of brushing the teeth.

What happens when using a soap-bearing dentifrice in the ordinary way for the purpose of cleaning the teeth is this: The alkalinity of the soap-saliva solution, being much greater than that of normal saliva, *tends first to complete the substitution of any replaceable hydrogen atoms that may be left in the mucinate*

molecule with such basic elements as sodium, and thus as we have seen *increases the adhesiveness of the plaque rendering it more viscid and tenacious than before.* A substitution of all the replaceable hydrogen atoms must occur before the substance becomes even slowly soluble in alkali. Dr. Gies, in a recent address, says: "The bristles of a toothbrush, when the latter is applied to the teeth in the ordinary act of brushing, are apt to pass through such a viscid film, after it is changed by alkali, without dislodging it; and the bristles may not completely remove the viscid mass, even by vigorous use of a brush. Anyone who has tried, with the aid of lime water or soap, and friction, to wash mucinous matter from a handkerchief containing nasal mucus knows how difficult it is to remove all the mucin from its attachments, under such conditions. The purpose to remove such mucinous material from the linen requires special effort when alkaline reagents are employed, apparently solely because of the adhesiveness of the viscid mucinate produced from the mucin by the applied alkali" (10b).

The talk about "neutralizing mouth acids" as a factor in dental caries, often seen in tooth paste advertising, is but another example of a selling argument based upon a false premise. It is an accepted fact that the only acid that has anything directly to do with the incidence of dental caries is, as we have seen, that which is produced at a *definite spot* and held against the enamel under the protection of the mucin plaque, and *not* to any *general acidity* of the mouth fluids (10c). Obviously a dose of alkali held in the mouth for a few seconds twice a day could not be much of a factor in dental prophylaxis.

Other important physiological effects of soap and various food substances in the mouth were pointed out several years ago by Pickerill and Gies. Allow me to call your attention to one or two facts and then refer you to Pickerill's book (1) and particularly to the investigations along this line made by Prof. Wm. J. Gies and reported in dental literature during the last twelve years. I refer now to the depressant action alkaline substances have on the rate of secretion and alkalinity of the saliva. The organs of the mouth, particularly the salivary glands, have the ability under normal conditions to maintain the alkalinity of the mouth fluids at a point just above neutrality. When soap or other salivary depressant is taken into the mouth, even for a few seconds, the glands respond by reducing the *rate* of flow and also the degree of alkalinity of the saliva secreted. In this manner the use of an alkaline dentifrice, in the ordinary way, may produce a sub-normal alkalinity of the mouth immediately after the introduced alkali has been washed away or neutralized. This lowered alkalinity of the saliva has been shown by Pickerill to persist for five minutes or more (1c). It is possible, however, that the considerable amount of strong flavoring materials present in soap containing dentifrices, may have a slight tendency towards counteracting the depressant effect of the alkali on account of their reaction on the taste stimuli. The total amount of ptyalin secreted into the mouth is also materially reduced under these conditions.

Turning now to the physiological and chemical effects of acids in the mouth and on the mucin plaque, we find that mild acids particularly the so-called "fruit acids" found in lemons, oranges, apples, pineapples, etc., have a stimulating effect on the secretion of saliva. The rate of flow is often doubled or trebled and the *degree* of alkalinity is increased also. This occurs every time an orange or grapefruit is eaten for breakfast. The ptyalin secretion is increased in effectiveness even more than the other salivary constituents, often from five to ten times that of "resting" saliva—I do not say "normal" because the eating of fruits is certainly a normal procedure. Since

the greater part of the food we eat is acid in reaction, is this not nature's way of increasing the quantity of ptyalin—this very important digestive enzyme—just at the time it is most needed?

Fruit acids or other "food-acids" (and the same is true of any suitable acid) have a definite chemical effect upon the mucin plaque. When a mild acid comes in contact with a molecule of mucinate *it pulls away the sodium or other basic elements and restores the original atoms of hydrogen, thereby reforming the original mucin molecule,* which as stated before, *is not at all viscid or adhesive but is precipitated in the form of small insoluble flakes.* In this way the mucin plaque as a whole is broken up and made easily removable. The eating of an apple or an orange regularly in the morning and the last thing at night would, undoubtedly, clean the teeth better and often more safely than the usual application of tooth paste, provided however the juices were agitated with the tongue so as to reach *all* tooth surfaces, and the mouth thoroughly rinsed with water afterwards so as to be sure to remove all traces of the solid constituents of the fruit, which if allowed to remain might lodge between the teeth and undergo local acid fermentation as we have seen.

We now have before us the essential biochemical facts upon which the so-called "acid theory" of dentifrices is based. These facts are not new. They have long been accepted as established biochemical knowledge. For several years Dr. Gies has been suggesting that these principles be considered and correctly utilized in the compounding of a dentifrice for general use.

Dentists have been very slow in accepting the idea of deliberately putting an "acid" into the mouth. In this they have been justified as it appears to run contrary to long established ideas and practice. An "acid" is usually thought of as something to be handled only with rubber gloves. The trained chemist who thinks of acids and alkalies in terms of ionization, dissociation, hydrogen ion concentration, PH values, etc., understands the mechanism which allows a concentrated solution of boric acid to be placed on the eyeball without harmful effects. Apparently these earlier workers did not make perfectly clear to the dentist the exact nature of acidity and alkalinity. In this they were handicapped, however, by depending upon the so-called "chemical indicators," such as litmus, as means for measuring the acidity or alkalinity of the fluids they were working with. General terms such as "mild," "weak," "slightly dissociated," "low degree," "strong," etc., as applied to acids do not satisfy the conservative dentist. He wants to know *how* "weak" or *how* "strong" in terms of something he is familiar with. Dr. Gies has told us, after long and careful study, that "'food-acids' in proportions lower than those in fruits such as oranges" (10d) could safely and advantageously be incorporated in a dentifrice—provided of course it were correctly compounded from other points of view as well. The dentist may be inclined to take Dr. Gies' word for it, but what assurance has he that the tooth paste manufacturer has the same conception as Dr. Gies as to what constitutes acidity equal to that found in oranges? Have the advertised claims made on behalf of various dentifrices in the past—or present—instilled sufficient confidence in the mind of the dentist?

The phenomena of acidity and alkalinity according to modern conception (12) are, in general, manifestations in a water solution of hydrogen ions (H+) and hydroxyl ions (OH—) respectively. An ion, is an atom—or it may be a group consisting of several atoms—which possesses when in water solution a definite charge of either positive or negative electricity. The possession of this electric charge tremendously modifies the behavior of the substance. Think of a

piece of metallic sodium when placed on water; the reaction between the two is like an explosion but after a few minutes all is quiet again. The sodium is still in the water but now they are at peace; what has happened? A general readjustment of electrical charges has taken place during which each atom of sodium has acquired a charge of positive electricity; therefore its properties have become greatly changed, and it is now called an "ion." At the same time some of the molecules of water have been made to yield hydroxyl ions (OH—) each one possessing a charge of negative electricity. Many, but by no means all, substances yield ions when in water solution, and the reaction is only rarely accompanied with violence. Some compounds simply split up, almost entirely, into ions while others do so less completely; that is only a small number of ions are produced and the substance is said to be but slightly "dissociated" or "ionized."

A substance is said to be *"acid"* when it produces in water solution, directly or indirectly, a preponderance of hydrogen ions over hydroxyl ions; and conversely, when the hydroxyl ions are present in greater numbers than the hydrogen ions, the solution is said to be *"alkaline."* When both of these ions are produced in equal numbers the solution is said to be *"neutral."* They tend to come together in pairs which allows their electrical charges to neutralize each other, and when this occurs a molecule of water (HoH or H2o) is formed. In general it makes no difference what other kinds of ions—and there are many—may also be present in the same solution. Now, *the strength or the energy with which an acid attacks a substance is determined by the concentration of hydrogen ions,* that is the number packed into a given space in excess of any hydroxyl ions. The same is true on the other hand when hydroxyl ions predominate, only then we are dealing with alkalinity. A "weak acid," that is, one producing a *low concentration* of hydrogen ions, may not attack a certain material at all, because the "hammering" of the ions is too scattered to take effect, but if the concentration of ions is increased, the cumulative effect of the larger number of ions "hammering" on the same spot at the same time may be strong enough to break down the resistance of the material which is then "attacked" by the acid. The same may be said about hydroxyl ions in attack by alkali.

The great importance of knowing accurately the exact degree of hydrogen ion concentration or the *"actual acidity,"* as it is called, of the materials under investigation becomes at once apparent, but unfortunately this cannot be determined with anything like accuracy by the use of chemical indicators. Pickerill states this difficulty in these words: "In discussing the reaction of saliva, it is always necessary to state the indicator used, since saliva gives quite different reactions with various indicators. For instance, the general rule is that all salivas are acid to phenolphthalein, owing to the contained carbon dioxid and bicarbonates, but that all salivas are alkaline to methyl orange, owing to this indicator not being affected by carbon dioxid; whilst the same salivas may be either acid or alkaline, or both, to litmus, owing to the presence of acid phosphates" (1d). This lack of exact information in regard to a most important point in the "acid theory" of dentifrices, is undoubtedly responsible for the widespread confusion and misundertanding (13) concerning it, while, on the other hand, the trained biological chemist is, by indirect methods, in the habit of picturing to himself, more or less accurately, the actual state of affairs.

A few years ago my attention was directed to a biochemical problem connected with root-canal therapy by a medical research institution, and during the subsequent investigation it became absolutely necessary for us to devise means

by which the *actual* acidity or alkalinity of the mouth fluids, in the presence of various other substances including dentifrices, could be quickly and accurately measured. Obviously no method depending upon a delicate color reaction could be employed as many of the solutions contained quantities of suspended matter and were opaque. During the time required to filter such a mixture chemical changes take place which completely alter the results. Due largely to the genius of Professor S. P. L. Sorensen of the Carlsberg Laboratory in Copenhagen, it has recently become possible to measure independently and with great accuracy, the actual number of hydrogen ions in almost any sort of solution. Sorensen's method (12a) has been successfully applied by certain universities to various chemical and bacteriological problems of long standing and much light already has been thrown into many dark places in scientific research.

Sorensen's method is essentially electrical and is based upon a fact long well-known to physicists. When a bar of pure metal, silver for instance, is dipped into a solution containing ions of the same metal, say silver chloride, and certain other conditions are fulfilled, there is a tendency on the part of the silver ions to give up their electrical charges to the silver bar and attach themselves to it as ordinary atoms; while, at the same time, the atoms of the metal bar endeavor to enter the solution and become ions. (A very human trait indeed!) A result of these opposing tendencies is to create an electro-motive-force (E. M. F.) on the bar. Since the density or *concentration* of the silver atoms in the bar is fixed and constant, the E. M. F. produced on the bar, when properly compensated for, bears a fixed ratio to the concentration of silver ions in the solution being tested. The value of this E. M. F., of course, can be read directly from a suitable voltmeter. Thus a silver bar to count silver ions; a copper bar to count copper ions, and so on, but how about a solid bar of hydrogen—the lightest known gas—with which to count *hydrogen ions* and thus measure the *actual units of acidity?*

It is well known that very finely divided platinum metal, called platinum black, can be made under certain conditions to absorb about 800 times its volume of hydrogen gas. A small platinum electrode sealed in a glass tube and covered with platinum black, saturated with hydrogen gas and means for keeping it saturated, constitutes in effect a very excellent bar of hydrogen. Space does not permit a description of the apparatus as finally developed for this investigation; suffice it to say that we can measure directly and easily the *actual* acidity or alkalinity of all the various fluids and mixtures encountered, with an accuracy many times that possible with any of the chemical indicators, and a reading can be taken in ten to twenty seconds after collecting the solution. An important relationship between the hydrogen and hydroxyl ions permits us to measure the concentration of hydroxyl ions as well.

Obviously the figures representing the actual number of ions in a cc. for instance, might run into the millions and be too cumbersome to use, so Sorensen has constructed a continuous acidity-alkalinity scale on a scientific basis by which the actual values can most accurately and conveniently be compared. This scale reads from 0 to 14. It should be mentioned, however, that the very strong acids and alkalies met with in the inorganic laboratory are not included in either end of this scale, for various reasons. Pure water stands at the center, therefore 7 represents the point of exact neutrality. Solutions reading below 7 are acid, and above 7 are alkaline. These figures are spoken of as the "pH" value of hydrogen ion concentration and represent *numerically* the exact *strength* or "activity" of acids and alkalies.

We are now prepared to get a definite

and clear idea of the acid or alkaline strength of various articles of food, dentifrices, etc., under all sorts of conditions. Unstimulated or "resting" saliva varies, in healthy adult individuals, from a pH of 7.5 to 8.2, while the saliva of a new born infant is usually very close to 7; and that of babies especially those who are breast fed is generally acid, being several hundreds of a pH below 7. The pH values of the salivas of several persons diagnosed as having so-called (what ever that may be) "Acid Mouths" were found, many to be alkaline, a few neutral and occasionally one as acid as that of a nursing infant!

As to various foods, some are neither acid nor alkaline as they produce neither hydrogen nor hydroxyl ions. A few substances such as bread, butter, tea and meat, while not actively alkaline themselves, tend slightly to depress the rate of salivary secretion. It would be difficult to find an article of ordinary diet that is actively alkaline while, on the other hand, a large part of the food we eat is actually acid in reaction. Vegetables and particularly fruits are decidedly acid. The accompanying chart tells an interesting story.

It is well-known that acids are usually characterized by a sour taste, but the addition of sugar, which is a neutral substance, can completely mask the sour taste without in the slightest degree affecting the acidity. For example, the addition of sugar to a dish of stewed fresh rhubarb does not alter its pH value, but every one will agree that the taste becomes very different.

Our taste centers are easily fooled in other ways as well. A small batch of tooth paste was made following the general formula used in soap-bearing dentifrices as published by certain manufacturers, except that all flavoring materials were omitted. It contained chalk twenty-two per cent, glycerine thirty-one per cent, alcohol twenty per cent, soap twenty-six per cent, and a little gum arabic to help keep the chalk in suspension. The taste was very unpleasant in spite of the fact that the sweetish taste of glycerine tended somewhat, to cover it up. Another experimental batch was made containing no soap or other bad tasting materials, but to which was added the essential oils and other flavoring materials in the amounts used regularly in one of the commercial preparations mentioned above. Only a small amount of this paste—less than a fifth of the usual quantity used on the toothbrush—can be tolerated in the mouth without discomfort, owing to the powerful and well-known effects of essential oils. Now the point is this: when the soap and essential oils are combined, the taste centers only are fooled, but the other physiological effects of both substances go on just the same. This important fact was called to my attention by a pediatrician in discussing with him the composition of a dentifrice for use by small children.

The pH values of a number of widely advertised dentifrices are shown on the chart. For convenience and uniformity these tests were made on a mixture of paste (or powder) and water stirred together in a small beaker, and they represent closely the pH value of the paste-saliva mixture immediately after the dentifrice has been introduced into the mouth on the toothbrush in the ordinary process of brushing the teeth. Of course the saliva by biochemical action, starts instantly to attempt to esablish its normal pH value. This electrical method for determining pH values offers the only possible means for *following the course of a reaction as it progresses.* For instance, it is of the greatest importance in our present problem to know the pH value of the contents of the mouth at every instant during the several seconds or minutes immediately following the introduction into the mouth of a dentifrice or other substance.

It is seen from the chart that the dentifrices containing soap range from pH 9

to pH 10.6. These values of alkalinity far exceed that of any foods found in nature or invented by man. On the other hand the several tooth pastes recently brought out on the "acid theory" show pH values, under similar conditions of test, ranging from 4.1 to 5.2. The strength or "actual" acidity of these pastes is less than that of most of the common fruits and much less than the vinegar we put on our salad. The fact that nature made so many foods acid and very few, if any, actively alkaline, certainly was not without purpose. The stimulating action of the acids in fruits upon the secretion and composition of saliva, which results in a stiffening of nature's natural barriers of defense, is but an example of the general law of life that "overcomeable stimuli" are necessary for the maintenance of health and vigor.

I do not believe anyone would say that the eating of an apple or a grapefruit is harmful to the teeth on account of the acidity of the fruit, or would they likely condemn the eating of strawberries on that ground (14). It has been said that the Sicilians who are in the habit of *constantly* sucking lemons (pH2.0) some times show a wasting of the enamel surface, but in spite of this it is well-known that dental caries is as rare with these people as it is common with us. The direct reasons for their immunity, doubtless, would be found in the absence from the teeth of mucin plaque with its consequent "spot" acidity.

The choice of suitable fillers for acid dentifrices is limited. Chalk, for instance, being slightly alkaline would, like soap, quickly destroy any kind of fruit—or other—acid. The various phosphates of calcium, being stable in the presence of very mild acids, are the principal fillers employed for acid pastes. In some cases a large proportion of calcium sulphate (ordinary gypsum) is included for the purpose of reducing the cost or the feeling of grittiness. The two most widely used materials are di-calcium phosphate precipitated in hard crystals which are crushed, milled and finally sifted. While this is a fairly cheap material and does not always feel gritty between the teeth it is hard to manufacture a uniform product in commercial quantities. The other is a substance often incorrectly spoken of as "tri-calcium phosphate" but really is quite a different material known to the trade as "bone ash". It is made from calcined or highly heated bones crushed and sifted, and consists principally of impure tri-calcium phosphate. The main objection to this product is the fact that it contains upwards of ten per cent of di and pyro-phosphates, etc., some crystals of which have been shown by Dr. Gies to scratch glass (9), and some to be totally insoluble in the mouth fluids. Pastes containing these materials are usually loaded pretty heavily with various gums or pasty substances such as starch, glucose, etc., for the double purpose of preventing the separation of the solid particles from the liquid constituents, and of masking, as far as possible, the feeling of grittiness between the teeth. It has been known for some time that true tri-calcium phosphate, if properly prepared substantially 100 per cent pure and precipitated in an amorphous condition, would make an excellent filler for tooth paste (9). Its inherent hardness is below that of the softest enamel; it has not the smooth pasty feeling of chalk but possesses a feeling of "body," while the particles readily break down between the teeth somewhat as does common salt. When correctly prepared it is slowly soluble in the mouth fluids,—about six times as soluble as precipitated chalk—and harmless if swallowed even by a child. This material properly prepared, has recently become available in commercial quantities.

These facts illustrate the importance of the treatment a substance receives during the process of manufacture. A

diamond, the hardest substance known, and graphite, a soft and excellent lubricant, are both practically pure carbon.

All wholly insoluble materials should rigidly be excluded from dentifrices as minute particles might find their way under the gums and cause trouble. It is generally accepted by dentists that the lodgment under the gums of an insoluble substance is often a cause of pyorrhea (14). Vegetable drugs or fibers such as orris root, sandal wood, myrrh, benzoin, etc., besides possessing insoluble constituents, have no place in dentifrices as they may be forced between the teeth and remain there long enough for their starch constituent to give rise to acid fermentation (11b). Starch and other carbohydrates aid greatly in giving "body" to tooth pastes, especially when soap is not used, but these are among the very substances a tooth paste should help to remove from the mouth. They also tend to thicken the saliva and render it more viscous thereby retarding the removal of food debris. A dentifrice should strive to have the opposite effect.

Such "food acids" as acid potassium tartrate (ordinary cream of tartar), tartaric, citric, and acetic (the acid in vinegar), are commonly used in acid pastes. One manufacturer "solves" this problem very simply and cheaply by adding a quantity of ordinary hydrochloric acid to his paste and waiting for this strong inorganic acid to react with the phosphate filler, until the strength of the acid is automatically reduced by partial neutralization. Should a freshly made batch reach the user before it has had time to "ripen," his teeth would likely be "put on edge."

An objection certain manufacturers have to the calcium phosphates, particularly the amorphous precipitated product, as fillers is the fact that only a very weak acid can be made to remain permanently in the paste. This is no doubt a most fortunate circumstance from the user's point of view. If an inert filler such as kieselgur (diatomaceous earth) were used in connection with a stronger acid the *initial acidity* immediately after taking the paste into the mouth would doubtless be too strong for safety. Unfortunately there are signs in the trade of a revival of interest in this harshly abrasive and insoluble substance as a possible filler for acid dentifrices.

Consider again for a moment the eating of an apple or an orange. The juices of these fruits are as a rule more strongly acid than the acid tooth pastes as shown by their respective pH values. The *time* one takes to eat an apple is very much longer than that usually spent in brushing the teeth. Furthermore, the fruit is taken into the mouth gradually, *each bite acting as a fresh application of acid.* The question immediately arises as to whether or not the *few seconds application to the teeth,* in the usual manner of brushing them, *of an ordinary acid paste of less acidity than that of an apple, can meet all the requirements of the acid theory for the removal of mucin plaque.*

Obviously the strength of the acid is at its maximum just before the paste is taken into the mouth, but instantly on meeting the saliva it becomes rapidly less and less until in a few moments it may become too weak to complete the precipitation of the mucin plaque. It seems evident that such a dentifrice would be more effective, from the acid point of view, if it should be applied to the teeth in a number of small, fresh applications, continuously, during a period of several minutes; but is this a practical procedure? The only other safe alternative would be to employ in the paste a substantial amount of a substance *which would not itself be an acid at all,* but would act as a *potential* acid; that is, it would be capable of releasing or producing, in the presence of the mouth fluids, a "food acid," having a maximum strength somewhat less than that of an apple, and in amounts sufficient to re-

pH VALUES OF VARIOUS SUBSTANCES

If you can measure that of which you speak, and can express it by a number, you know something of your subject; but if you cannot measure it, your knowledge is meagre and unsatisfactory.

— LORD KELVIN —

NEUTRAL POINT

(Pure Water) "Resting" Adult Saliva.

. . . 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 . . .

ACIDITY (H^+) ←——|——→ ALKALINITY (OH^-)

DENTIFRICES

ALKALINE

PASTE (½ Paste ½ Water)

No.*	pH
1	9.22
2	10.26
3	10.60
4	10.10
5	9.50
6	10.44
7	9.05
8	9.40
9	9.45
10 A paste containing both soap and fruit-acid crystals, but no water. Acid is instantly destroyed on contact with water or saliva, leaving excess of soap	8.36
11 A magnesia paste	8.88

POWDER (¼ powder ¾ water)

12	9.74
13	8.12
14	9.22
15	10.16

LIQUID (½ liquid ½ water)

16	9.56
17	8.18

MOUTH WASH (½ wash ½ water)

18	8.3
— Lime water U. S. P.	13.95
— Lime water U. S. P. (1 table-spoonful in ½ glass of water)	11.63

SUBSTANTIALLY NEUTRAL

PASTE (½ paste ½ water)

19 Containing potassium chlorate; no soap or acid	7.58

ACID

PASTE (½ paste ½ water)

20	4.1
21	4.4
22	5.1

** Reference numbers indicate proprietary articles selected from the most widely advertised of their class and purchased in various drug stores.*

+ Some soaps show a higher alkalinity due to the presence of "free alkalies" (sodium hydroxide etc.)

VARIOUS FOOD AND OTHER SUBSTANCES

(All fruits and vegetables fresh)

No.	pH
— STRAWBERRY - The pH of different kinds varies considerably while that of other fruits is quite constant. pH 1.6 to 3.1	
— LEMON	2.0
— GRAPEFRUIT	2.84
— ORANGE	3.36
— " - over-ripe	3.62
— PINEAPPLE	3.36
— APPLE - Spitzenberg	3.55
— " Greening	3.24
— " Northern Spy	3.39
— " Jonathan	3.70
— " Delicious	4.08
— " Wine Sap	3.61
— TOMATO	4.4
23 CIDER VINEGAR and WATER - equal parts	3.08
— LIQUID in dish of spinach after adding small amount vinegar	3.9
— STEWED RHUBARB (before adding sugar)	3.37
— STEWED RHUBARB (after adding sugar)	3.38
— BUTTERMILK - Bulgarian	4.45
— " - 3 hours after churning	4.92
24 CHILI SAUCE	3.75
25 CATSUP	4.0
26 LIQUID in bottle sour gherkins	2.86
27 " in bottle sweet pickles	2.71
28 " in bottle green olives	3.91
29 CARBONATED WATER	5.6
30 SWEET APPLE CIDER	3.36
— BORIC ACID - Concentrated solution	3.58
— Comparatively strong solution fruit acid (pH 1.5) added to excess of calcium phosphate used in certain acid pastes; tested after standing two weeks	4.09

SOAPS

(Thick foamy solution)

31 CHEAP YELLOW LAUNDRY +	10.62
32 HIGH GRADE WHITE LAUNDRY	9.96
— PURE CASTILE	10.20
33 SHAVING POWDER	10.85
34 SHAVING CREAM	10.92

place the acid so produced, as fast as it was used up.

Such acid-producing substances are not unknown to chemistry and their use in dentifrices might become mainly a problem of suitable selection, of commercial manufacture and of incorporation without loss of effectiveness. This might require much patient study to overcome the technical difficulties, but is not beyond modern chemical technic.

But after all is said and done in regard to *preserving* the teeth of the present generation, let us never forget that it is our responsibility to see to it, through the application of correct dietetic principles, that, in the next generation, *a dental equipment shall be developed which will possess its own natural barriers of defense.*

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FIXED BRIDGEWORK ON VITAL ABUTMENTS

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(Read before the Chicago Dental Society, November 21, 1922)

SOME one has truly said, "It is a serious thing to be a dentist now-a-days." Knowing as we do that the mouth health and consequently the general health of the patient is dependent upon what we do for that patient, throws upon us a responsibility that should make us approach each dental operation with all the wisdom and skill we possess. It seems to me that in none of the many branches of restorative dentistry do we need more thoughtful care and painstaking attention to detail than in the construction of fixed bridgework. So many sins of omission and of commission may be embodied in a single piece of fixed bridgework that there is small wonder certain members of the medical profession and of our own have uttered words of scathing criticism and condemnation. These critics had just ground for their disapproval of certain specific pieces of fixed bridgework, but to my mind are not justified in condemning the whole principle of fixed bridgework because of these examples. For in my honest opinion these failures are not due to the fact that these bridges were fixed but because of the kind of fixed bridges they were. After all is that not true in all branches of dentistry? Because some operators were unskillful in the use of gold foil and because they used no judgment in the placing of porcelain inlays, because they did not take the time to study in fullest detail those things necessary to know before properly giving an anesthetic is it fair to condemn all gold foil and porcelain operations, and to say that general anesthesia is a failure? In other words, does it not come right back to the same old trouble—unqualified workmanship? An honest answer must be that certain fixed bridgework was and is and always will be a failure because the operator himself dooms it to failure. And as a matter of fact is he entirely to blame? Is it not possible that he was actually taught in school, and later by means of clinics and lectures, to construct his fixed bridges in such a manner that they were bound to be failures? And yet the hopeful part of it is that we have all seen restorations that are not failures, that are serviceable, lasting, cleanly and esthetic. What then is the answer and the hope for the future of fixed bridgework for I believe in it, more and more every day, and am looking forward to the day when it will take its rightful place along with other dental procedures—a proven success. That time will not come, however, until we recognize the fact that the trouble in the past and in the present is the lack of correct fundamental principles. In the first place the man himself must be fundamentally right; he must be that type of individual to whom honest endeavor, pride and skill in workmanship means much more than the fee received. He must be willing to make sacrifice of time and money for research and technical study that he may perfect himself in those things he knows he is unskilled in. And

then he must recognize, study and conquer the fundamental principles which will allow him to build in accordance with his ideals. Then only will fixed bridgework come into its own, for fixed bridgework is absolutely dependent upon these things. What then constitutes correct fixed bridgework? I should say that type of restoration which more nearly approaches the normal natural teeth in form, function and beauty. It can only approach the ideal, because anything we may construct will not equal normal natural teeth. It should be self-cleansing or easily cleansible in every portion, and should maintain the adjacent soft tissues in as nearly as possible their normal health. Is it possible to construct fixed bridgework which answers all these requirements? Perhaps not in every detail, but we can at least feel that a good start has been made toward that ideal. The further I go in the construction of restorations the more I am convinced of the necessity of following a definite routine for best results. The first step in that routine is to determine the factors which go to make up a correct fixed bridge. To my mind they are: (1) proper diagnosis; (2) proper construction of abutments; (3) proper construction of pontics; (4) assembly, placing and check-up.

And the most important of these is the first—proper diagnosis. For what shall it profit us on our patient to build ever so beautiful a restoration if our foundation is all wrong. Diagnosis again is divided into two phases: (1) general diagnosis to determine the procedures necessary for health; and (2) technical diagnosis to determine the procedures necessary for proper construction.

For the purpose of a routine correct diagnosis, I believe it is necessary to have: first, radiograms, sufficient in number to show every tooth, crown, root and investing tissues; second, full upper and lower study models; third, a chart showing cavities, faulty fillings and contacts, mobility of every tooth and any abnormal condition of soft tissues which would not be plainly shown by radiograms or study models.

This chart should also contain a questionnaire so devised that it will draw out facts showing whether or not the patient is in really good health. In case of doubt a thorough physical examination should be required. With this chart and study models at hand for reference, we should then study the radiograms. We shall consider at this time only the question of which, if any, teeth are to be extracted. My conclusions are based upon the laboratory findings of Russell L. Haden of our staff, which findings I know to have been obtained in a manner thorough and beyond question. Single rooted teeth were extracted aseptically, their apical ends clipped into sterile normal salt solution. Half of this solution is added to test tubes of brain broth, and the other half to brain broth agar. These in turn are incubated forty-eight hours. Then the colonies in the deep tubes of agar are counted. Only colonies of ten or more are considered as showing infection. The root tips cultured are divided into three classes: (a) those from vital teeth; (b) those from non-vital teeth without definite apical areas; (c) those from non-vital teeth with definite apical areas. His purpose is to culture at least 500 tips from each group. So far he has cultured 491. His findings are as follows:

Class A, vital teeth—Tips cultured, 170; colonies of 10+ (5); per cent, 3.

Class B, non-vital teeth showing no definite areas—Tips cultured, 169; colonies, (53); per cent, 32.

Class B, non-vital teeth showing definite areas—Tips cultured, 152; colonies, (90); per cent, 59.

Using these findings as a basis and although as the number of tips cultured increases it is possible that these percentages may change somewhat, it would seem that the only safe plan to follow at present would be to extract: (1) all non-

vital teeth with definite apical areas; (2) all non-vital teeth whether they show areas or not in the mouths of patients who are suffering from a serious systemic disease which is due to a focal infection. Such diseases are arthritis, myositis, endocarditis, pericarditis, iritis, nephritis, pyelonephritis, chrolesystitis and possibly gastric and duodenal ulcer.

We may leave certain non-vital teeth without areas which occupy positions of strategic importance from the standpoint of restoration, provided the patient's resistance is good, and his physical condition upon examination is found normal. The patient should also be told of the possible future menace of those non-vital teeth, and be willing to assume responsibility for possible future loss of those teeth and restorations attached to them. It is also our duty to advise a check-up of those teeth at intervals for observation of any progress of infection. We should extract those teeth which are so affected by gingivitis or trauma as to present deep seated pockets and absorption of process sufficient to make their future retention an uncertainty. We should extract those teeth which present exposed pulps which we know have been exposed to infection, and whose roots may not be certainly filled perfectly and aseptically. We should extract such malposed teeth as may not be corrected by grinding and which interfere seriously as regards proper occlusion with a restoration which is important to the health of the patient.

Having decided what teeth are to be extracted we mark those teeth on the study model with a cross and are then ready for our technical diagnosis. I believe we should, with the aid of radiograms and study models, set down on paper the actual conditions as we find them. We can then, and only then, plan a restoration from which we may expect lasting service, beauty and cleanliness. For the purpose of properly recording our diagnosis for present and future reference, we have devised and use a bridge diagnosis chart on which we carefully note:

1. The number of abutment teeth as compared to the number of pontics that we may decide whether they constitute sufficient piers to withstand the stress that is to be brought to bear upon them.

2. The degree of mobility which they exhibit, for if they are not standing firmly while carrying only their own opposing stress, is it not reasonable to believe they will be less able to bear any additional stress hung upon them? This condition is not surely diagnosed by means of the radiogram alone, but should also be tested digitally, as the radiogram may show the root surrounded by bone for only one-half its length and yet upon digital examination the tooth will be even unusually firm in many cases and constitute a fit abutment tooth.

3. The stress of occlusion which is to be brought to bear upon the bridge should be carefully noted for depending upon whether it is heavy or light will be determined the type of abutment and pontic for each case. Also, in some cases, it may be such that a fixed bridge is not indicated at all, while again it will allow an otherwise impossible bridge to be placed. For example, in the case of a heavy end to end bite with all lower teeth present, a fixed bridge from right upper central incisor to right first molar would be contraindicated, whereas it would be permissible in case the patient was wearing a full lower denture.

4. The teeth which are to occlude with the bridge should be noted carefully to determine whether they are to be ground before constructing the bridge and how much. For example in a case we are to supply a lower first molar, which has been out for some time, we frequently find that the upper molar has dropped. It should be our aim always to keep the occlusal plane as nearly normal as possible for full efficiency in mastication, and unless the natural position of the upper molar is noticed and

corrected before the impression for the bridge is taken, we must either trim it to correct plane alignment upon the articulator and then grind it in the mouth when the bridge is placed or else set up the bridge in conformity with this malalignment. In the first case, unless we have told our patient of this mal-position and shown it on the model, we may and usually do have difficulty in persuading them to let us grind this tooth *after* the bridge is constructed and placed, and even then I believe there remains the thought in their minds that some mistake was made in constructing the bridge, and that we had to grind to remedy that mistake. Without study models this mistake will pass unnoticed in many, many cases to our subsequent regret.

5. The alignment of the abutment teeth should next be studied to determine whether a fixed bridge will seat properly after construction. The alignment of the posterior teeth, particularly the lowers, is difficult to determine by examination of those teeth in the mouth. Many times they seem fairly normal in alignment, but when we get a model of them we find that they are so badly tipped as to make correct seating of a fixed bridge impossible. Particularly where inlays or three-quarter restorations are to be used as abutments is it necessary to have good study models that we may so plan our abutment preparations as to ensure the bridge seating properly after its construction. In the case of anterior restorations, we would save ourselves a great amount of grief if we made study models for every case. In the first place it allows us to plan our preparations so as to compensate for mal-alignment. Secondly, in cases where one or more anteriors are to be extracted if we get our study models of the mouth before the teeth are extracted, we can make a more esthetic and harmonious restoration. Third, in cases where the space between abutment teeth is too narrow for normal sized teeth we can make millimeter gauge measurements of spaces and remaining teeth, and plan our construction so that the result will be much more pleasing.

6. Next the physical aspect of the abutment teeth should be taken into consideration as regards:

(1) The root. If we apply the laws of leverage it is readily seen that the position of the fulcrum represented by that point on the root at which the bony attachment ends, will determine to a large degree the amount of stress that may be safely carried. The tooth when studied from this standpoint becomes a lever of the first class, and, therefore, a root with firm bone attachment for two-thirds or more of its length should carry much more load than one having firm bone attachment of half its length or less. The point I am trying to make is that the actual length and strength of the root itself does not necessarily indicate a strong abutment foundation, but the length and strength of bony attachment does. On the other hand we cannot expect a relatively frail root like those found on lower incisors and upper laterals to carry as much load as a long strong cuspid root.

(2) The crown must also be considered from the physical aspect in making our diagnosis. First as regards its length, for if we have a tooth with very short crown the axial walls of the preparation for the abutment will be correspondingly short, and have less resistance to displacement under stress. For example, in supplying two or more pontics for a posterior bridge, if we have abutment teeth with relatively long crowns we may use M. O. D. inlays as abutments; while if the crowns are short we shall be much safer to use three-quarter veneers. Likewise, if the crowns of the abutment teeth are noncarious we may allow them to carry more stress than where they contain one or more cavities with consequent weakening of the remaining walls. We should also note

carefully the location, condition, and extent of existing fillings in the abutment teeth. For example, if we find a well fitting distoclusal inlay or gold foil filling on an upper first bicuspid, and are to supply the missing second bicuspid, we may construct an inlay for the first molar carrying the second bicuspid pontic with a lug resting in a slot cut in the distoclusal angle of that inlay or foil filling. On the other hand if the abutment tooth or teeth contain large amalgam or other restorations, it is well to thoroughly examine and in doubtful cases remove these restorations before proceeding with the diagnosis, for it is evident that their presence may indicate a weakness, making the abutments insufficient to carry the stress to be placed upon them.

In many cases which come to us we find evidence of mechanical abrasion which has progressed to such a degree as to require an opening of the bite to bring about full masticating efficiency, restore facial harmony and promote muscular and throat tissue health. There seem to be three distinct types of mechanical abrasion which require different forms of treatment, namely:

First, those cases where the occlusal surfaces of the posterior and the incisal edges later surfaces of the anteriors become more or less evenly abraded, sometimes to a depth of one-third or even more of the normal length of the teeth. This type apparently develops from an original end to end bite.

Second, those cases where the occlusal surfaces of the posteriors and the lingual surfaces of the upper anteriors show marked wear with or without an equal amount of abrasion of the labial surfaces of the lower anterior teeth. This type apparently develops from an original normal bite.

Third, those cases where the abrasion takes place on the occlusal surfaces of the posterior teeth, the labial surfaces of the upper anteriors and the lingual surfaces of the lower anteriors. Apparently a development from an original prognathism.

In these cases we should determine how much the bite should be opened to present a normal condition for that particular patient. Also whether the mandible has dropped back and if so how far so that we may bring it forward and hold it by means of our restorations. Also we must provide for esthetics that an unseemly display of gold is not produced. This condition of abrasion, causing a closed bite, is much more common than we think, and is easily overlooked by a cursory examination of the mouth. Only study models reveal it in many cases. In the more advanced cases the patient suffers from a constant strain which has developed so slowly over a period of years that he has come to regard it as normal. Usually he does not speak of this feeling of strain at all, but comes for relief from a growing sensitiveness, as the teeth wear closer to the pulp. However, when the strain is removed by building the teeth back to normal the gratification of the patient and the change in his appearance to a degree that is sometimes remarkable, have caused me to stress the importance of this part of the diagnosis.

8. If teeth are to be extracted it is determined at this time whether we shall restore them immediately or wait for absorption and shrinkage. Observation of results has caused me to believe that under proper conditions there is no more cleanly and esthetic pontic than that type using an over-glazed porcelain root properly placed in the tooth socket. This type of pontic must, however, be used with judgment and with a full knowledge of the indications for its use; otherwise it will be an unsightly failure. It may be used in cases where one tooth, either anterior or posterior, is to be replaced providing the supporting tissues of that tooth are not destroyed either by disease or by trauma during extraction. In

cases where two or more upper incisors or adjacent bicuspids or molars are to be replaced, providing the same condition of supporting tissues exists and providing further that those supporting *bony* tissues are relatively thick and strong. In cases where two or more lower incisors are to be replaced, the supporting tissues being just described, and providing the bridge be set temporarily so that more porcelain may be added to the roots for in these cases there is invariably greater shrinkage.

It should not be used where the supporting tissues are diseased as in pyorrhea, where the buccal or labial plates of process have been fractured or removed in extracting, where the supporting bony tissues are thin nor where more than two adjacent posterior teeth are to be replaced. It is understood that where porcelain roots are to be placed in molar sockets the process which existed between the roots must be trimmed after extraction so that the porcelain extension may be placed.

In cases where this type of pontic is to be used, it is found best to prepare the abutment teeth, make and place the abutment pieces and take the impression before extracting the teeth.

In anterior cases where the conditions describe prohibit the use of this type of pontic, it is best to construct a partial denture to be worn temporarily until sufficient shrinkage has taken place, usually three months will suffice. Notation is made on the chart as to which course is to be pursued. With all this data at hand we may now intelligently plan our construction. It may seem absurd to go to all this trouble just to plan such a simple thing as a fixed bridge, but as a matter of fact it does not take a great deal of time, avoids many pitfalls that may spell failure and is truly appreciated by the intelligent patient whom we should take into our confidence and explain the necessity for thoroughly studying his individual case that best results may be obtained. Besides, the more we follow this routine study the more we are convinced that there are very few simple bridges. I shall try to present a brief classification of conditions which determine what type of abutment, I believe, is indicated for those conditions. This is simply a guide to point out the various types of cases which present in practice and types of abutments which experience has shown will best take care of them. It is also understood that practically all of these abutments are constructed on vital teeth in accordance with our general diagnosis.

On vital anterior teeth without caries or fillings, and where the bite is normal, we use the three-quarter veneer, as described by E. T. Tinker except that we do not use the incisal groove or any distinct shoulder at the gingival. This type of abutment when properly constructed using a hard gold constitutes, I believe, the most secure, cleanly, and esthetic type of abutment, and at the same time insures the vitality of the pulp to a greater degree than any ever given to the profession. I predict that as time goes on and the profession becomes more familiar with this preparation as it *should* be made, not as it too often *is* made, that it will come more and more into use and as its value is learned. In cases where the anterior teeth present moderate proximal caries it should be removed and the cavities filled with cement and the typical three-quarter preparation made. After the bridge is finally set a proper cavity is cut in that portion of the labial surface, which was previously filled in with the cement, and the cavity so formed filled with gold foil or a silicate.

In cases where the anterior teeth present proximal foil fillings not involving the angle which are perfectly preserving the teeth, the typical three-quarter preparation is made without removing the fillings.

In cases of abrasion, where the bite is to be opened, the slice preparation is

used. In cases of lingual or labial abrasion, where the bite is not to be opened, a modified three-quarter preparation is used. These preparations will be described later. In cases where the anterior teeth present proximal cavities or fillings, involving the angle, we make as nearly the typical three-quarter preparation as the conditions found will permit.

With the great development of casting technic, combined with the production of various hard gold alloys, has come an opportunity to make quite radical changes in cavity preparation for abutments on vital posterior teeth. Where we undertake to cut into perfectly sound molars and bicuspids for the purpose of making cavities and then inlays for them for the purpose of carrying bridges, we take upon ourselves a serious responsibility. If we are not certain that we can cut away tooth structure and replace that lost structure in such a manner as to ensure both its immunity to caries and pulp vitality are we justified in so cutting it? I believe that if a fixed bridge is to be a success, the abutments should be so constructed as to hold that bridge so firmly in position that it may be used in normal mastication for an extended period *without* cementation. I believe further that the real retentive feature of an abutment answering this requirement is found in the tenso-frictional resistance to displacement of correct adaptation of a hard material against opposing, nearly parallel axial walls. If that be true, then, the longer and broader those axial walls the greater the resistance to displacement. At the same time the further those axial walls are kept from the pulp, the less will be future irritation to that pulp and consequently greater assurance of its continued vitality. I believe that the system of cavity preparation taught by Dr. Black was meant primarily for materials which do not have the qualities of hardness, toughness, and edge-strength, such as is possessed by certain gold alloys which we have today. I believe further that the *principles* of cavity preparation which he gave us are fundamental and should be followed, but that the necessity for the box-like preparation does not exist today, due to the fact that we do have these tough materials. In other words I think it is now fit and proper to modify the cavity preparations for posterior teeth to meet present day conditions. It is only after a period of two years' trial in practical cases which have been checked up sufficiently to give me complete confidence in their practicability that I ask permission to present the following proximoclusal, M. I. D. and M. O. D. preparations for vital teeth with a modified semi-indirect wax technic to go with them.

These slice preparation inlays, combined with the various three-quarter veneers developed and described by Dr. Tinker, will take care of practically all vital teeth restorations with a minimum of cutting and a maximum of strength, cleanliness and restoration of form and function.

Upon the proper construction of these abutments as regards proper wax and casting technic will depend to a great degree the success of the bridge, for a leaky or overhanging margin spells eventual failure, of course. Correct occlusal carving and proper contact points are also of vital importance. For casting I believe more in the elimination method than ever, for its possibilities of a definite standardized routine make correct casting comparatively simple.

Besides the porcelain root into socket type of porcelain extension there are two other types of pontics, namely: the porcelain tip and the porcelain ridge lap. These two types are used where the teeth have been extracted for some time so that absorption has taken place to a greater or less degree. The porcelain ridge lap is used in the case of readily visible pontics where to make simply a

porcelain tip touching the crest of the ridge would leave unsightly proximal embrasures, through which also the air would escape in talking. If the facing be ground to lap the ridge in such a manner that it presents a normal, natural appearance, and then the ground surface be covered with a very thin film of medium-fusing porcelain and this overglazed, the result is much more pleasing in appearance and seems to be as cleanly. In the case of posteriors, where absorption has taken place, a truncated cone-shaped porcelain extension with the blunt end causing a slight impingement of the tissue on or near the crest of the ridge seems to give best results. The gold portions of all pontics should be carved, as to their occlusal markings and general contours, as nearly like natural teeth for the particular case presented as possible. Particular care should be exercised to make all contours convex and to limit the buccolingual diameter of the working occlusal surface as it is limited in nature, that is to one-half or less the buccolingual diameter of the tooth at its widest portion. Embrasures should be sufficiently wide for thorough cleansing and all abutments and pontics should be in contact before soldering so that there will be no contractions during soldering operations, and also that solder contacts will be as small as possible.

Since the tactile sense of the cusps and planes is the real determining factor controlling the excursions of the mandible, it is difficult for me to see how we can construct a fixed bridge properly with anything less than full upper and lower casts of the teeth mounted on an antagonizer which will allow these natural excursions. Moreover, since harmony plays such an important part in esthetics it is to my mind necessary to have full casts to produce that harmony, since we can only guess at the proper set up of facings for the working side unless we have a counterpart of the opposite one as a guide.

In soldering I find it is a common fault to drop the soldered piece into cold water and then to pickle by heating the case to redness and then dropping it into cold acid. This tends to produce extremely brittle solder joints with consequent greater possibility of subsequent breakage. Every soldered case should be cooled slowly and pickled by boiling in acid to avoid this brittleness. Every case of fixed bridgework should go to place without binding or springing the abutment teeth. If there is such a springing or binding, the bridge should be cut apart at the proper place and the pieces put to their proper place separately in the mouth. A small impression taken either with plaster or modelling compound is then taken of the parts immediately surrounding the joint. When hard this is removed and the pieces placed in the impression. Investment is then poured and the case resoldered. I consider it so important to have no stress or strain that our bridges are not assembled in full any more, but are made in sections and polished. These sections are then placed in the mouth and assembled as described.

There are three points in cementation that are worthy of consideration. First, it seems to be common practice to flood the cavity with alcohol or acetone and then direct a stream of hot air upon the cavity for a continued period. This not only dries the cavity but I believe actually dessicates the openings of the tubules wherever the cavity extends to the dentin. These tubule openings are then actually thirsty for moisture and when thinly mixed cement is forced into the cavity by the pressure of a three-quarter restoration, for example, is it not reasonable to believe that this thin cement enters the tubules even further than we think with consequent pulp irritation and possibly subsequent death of the pulp?

Again in mixing cement it is necessary to release the heat generated in most

oxyphosphates by spatulating long and thoroughly spreading the mixture over a wide area of the slab so that the heat units have an opportunity to release themselves by contact with the cold slab. If a hurried mix of cement with very little spatulation be tested with a thermometer the degree of heat generated and shown on that thermometer will cause us to realize why our patients experience so much pain many times when bridges are set. Besides the heat there is also with many cements a quantity of gas generated by hurried mixing, so much that if the mass after setting is broken open and examined it will present much the appearance of Swiss cheese. Finally from observing that most inlays that come loose show cement on either the inlay or the cavity almost never on both, I am led to believe that a film of air is caught between the layer of cement and the tooth or inlay as the case may be which prevented real union. This may be avoided by smearing cement both on to the inlay and into the cavity so that if a film of air is caught between it flows out with the excess cement and allows firm union. Since we are using very hard gold alloys and since these alloys wear but very slightly in mastication, it is of extreme importance that we watch our occlusion very closely that trauma may be avoided. When we used pure or twenty-two carat gold for our castings, if a point on an inlay or pontic was high, it was usually sheared off in time by the patient without serious injury to the tooth, but this will not happen with our hard golds. As a consequence the tooth or bridge is pounded continually by mastication and during the act of swallowing with consequent inevitable trauma and probably ultimate loss of tooth or bridge. Therefore when the abutments are placed, before the impression for the bridge is taken, we should by means of articulating paper discover any high spots and dress them down and keep at it until both we and the patient are certain that it is not too high. Then after the bridge is placed the same procedure should be followed as to the pontics and the bridge as a whole. This should be done before and after setting if necessary for if the patient be dismissed with the bridge in traumatic occlusion soreness will develop and when the patient returns later it will be practically impossible to get that patient to bite properly because of that soreness. It is important also that the patient return at intervals for a check up, especially in extensive cases, so that some unnoticed high spot will not develop trauma. In conclusion it is my firm belief that fixed bridgework has a most important place in restorative dentistry providing it be properly constructed.

That the chief causes of failure are absolutely preventable and are traceable to ourselves.

That these causes are chiefly: First, improper diagnosis, whereby we place these restorations without giving serious thought and study to all the factors which should determine whether a bridge is indicated and if so, what kind; second, improper technic whereby we do not give enough attention to every detail of construction and use materials that are indicated for the type of restoration used; and third, incomplete service, whereby we do not keep our cases under surveillance for a continued period after insertion that we may correct any developments which may become injurious.

Discussion

R. E. MacBoyle, Chicago, Illinois: The indications today are that many of the dentists who became radical in their views against fixed bridgework are gradually becoming more conservative, and realize that there is a place in dentistry for fixed bridgework. If we follow the outline that Dr. Knapp has given us, there will be a great improvement in the quality of fixed bridgework.

If it is true, that the majority of fixed bridgework has done more harm than good, theoretically we would say it should be done away with entirely, but I do not believe that is the way of righting the problem.

The principles underlying fixed bridgework

are good. The trouble is that the dentists abuse the principles, so that it is unnecessary to give up fixed bridgework entirely, but I believe it is necessary for us to do away with the abuses.

The demand for fixed bridgework is greater than it has ever been in the history of our profession, for the reason that there is a great deal of extracting of pulpless teeth, leaving a great many small spaces in the mouth. The demand today for supplying lost teeth in small spaces creates a demand for fixed bridgework. On account of this extraction we have mostly vital teeth to deal with as our abutment teeth, hence the problem of constructing abutment pieces for vital teeth.

It is comparatively few years since we have been using the X-ray very extensively, revealing the conditions surrounding the roots, and we find the old method of devitalizing teeth in cases of crowning for bridgework was wrong. The matter of gingival irritation today is a serious one, as the X-ray has taught us, consequently there is a new order of things when dealing with vital teeth as compared with a few years ago.

The problem of supplying missing teeth is a complex one. Certainly, no one system will answer in all cases. There are many places for the use of removable bridgework, and there are many places for the use of fixed bridgework. For abutment pieces, there are certain conditions which we must meet according to our present day knowledge as revealed by the X-ray. An important one is to conserve the pulps of teeth.

We should strive for a minimum of tooth mutilation in the construction of our abutment pieces for vital teeth, because if we use vital teeth for abutments and we excessively mutilate them, the pulp may die from thermal shock.

The one thing we should keep in mind in connection with a pontic for a fixed bridge is that it should be cleansible.

We should do all we can in the construction of our bridges to procure a normal anatomical occlusion, but I do not believe that it is possible for the dentist, even though he uses study models, and constructs his bridge most carefully, as outlined by the essayist, to place a bridge in the mouth and excuse his patient and know that the occlusion is correct. We should always instruct that patient to return in a few days' time in order that we may check up that occlusion, because with the excursive movements of the mandible there will always be places on that bridge which will need some trimming, some changes, and you cannot determine that at the time the bridge is mounted.

If I refer to the porcelain roots I would rather refer to them as porcelain tips. It is a very delicate matter to properly construct a pontic with a portion of root extending up into the socket of a recently extracted tooth. He mentioned one fact, it is necessary that they must be of highly glazed porcelain and not in contact with any of the bony tissue, and if they are not extended too far—in many cases the results are good, but in my experience so far, the ones I have observed at least, the results are not always pleasing. It is a matter that requires a great deal of careful work and careful technic.

I differentiate entirely between the upper pontic for an upper posterior bridge and for a lower. I never allow the gingival end of the pontic to touch the tissue in a lower posterior bridge. I leave a washable space and shape the pontic at the gingival end so that it can be readily cleansed by the patient. A pontic in contact with the issue is more pleasing to the patient, but in my experience, where we leave a space in case of a lower posterior bridge, it is only a matter of a day or two that the patient will mention or complain of the space. When they are told that it is left for a matter of cleanliness, it will never trouble the patient. In an upper posterior pontic, I like the highly polished porcelain surface to come in contact with the tissues.

Study models, are in many cases, especially the rather extensive cases, a great help and should be used, especially for the large cases where it is necessary to open the bite, and also for measuring the spaces we have to fill in with the pontics. For the more simple bridgework, I seldom use study models.

I have placed many missing single upper central incisors by using the other central incisor as an abutment, placing a rest properly fitted against the lateral at the lingual and gingival and it has been a successful operation.

Diagnosis includes the stability of abutments, the spans which are to be supplied by the missing teeth, the bite conditions, and there are so many things we must consider in diagnosing conditions, and there is no question but what this one phase has been terribly abused—the matter of proper diagnosis, and then placing fixed bridges where they are not indicated.

In my experience teeth standing alone often require support. We hear a great deal these days about the movability of individual teeth, and that for that reason a fixed bridge is never indicated because it fixes the teeth so that they are not movable. There are many good teeth lost by fixed bridges because the spans are too great and the teeth move too much. There are many cases in which a fixed bridge is absolutely indicated, not in too great spans,

which, when properly adapted and properly secured, will give support to the teeth standing alone. I refer to the upper second molars where the first and third molars have been lost. I have seen many cases of that type where a fixed bridge, using the second molar as an abutment, and swinging in one or two pontics, has supported the second molars increasing their span of usefulness immeasurably by the fact that we have supplied a fixed bridge as a support.

I have not been an advocate of full upper and lower fourteen tooth bridges recently, but I believe there are cases where full upper and lower fourteen tooth bridges may be constructed advantageously, and that if we have a sufficient number of abutments properly distributed oftentimes we do not inhibit the movement of these teeth to any serious degree.

The case which I consider quite unfavorable for a fixed bridge is the one with an extremely short bite. In an upper or lower case with several posterior teeth missing on both sides, where we have the ordinary, medium, or long bite, we can use fixed bridges but in the case of an extremely short bite, that is as a rule, an indication for some removable structure from the standpoint of cleanliness.

Dr. Knapp (Closing): There are one or two points which Dr. MacBoyle made in regard to the construction of pontics which I would like to speak of for a moment. If porcelain tip or root extension has any virtue it lies in the fact that the tissue will not only tolerate but apparently closely embrace properly glazed porcelain impinged against it or when it is placed properly into sockets. Now if placing the porcelain tightly against the tissue does not cause irritation it certainly makes far greater cleanliness in that food can not get between it and the tissue. The surface of the porcelain is so smooth and slippery that food cannot stick to the sides of the porcelain extension and finally it feels more like a tooth to the patient and is consequently more comfortable. I have yet to remove a bridge containing the so-called sanitary type of dummy with gold next to the tissue and not find it covered with a scum of debris and decomposition which varies in thickness dependent upon how thoroughly the patient brushes the surface. Therefore I agree that Dr. MacBoyle may have what he calls a "washable space" but I am not of the opinion that it is a cleansible space; this scum may not be a serious objection and yet Dr. House tells me he has found edentulous mouths infected from the scum of full dentures. In cases where we use the porcelain root extensions it should be understood that we do not set the bridge with cement until we are sure the sockets are healing perfectly; that is usually a week or ten days after the bridge is first placed. We use a stiff mixture of carbol-eugenol for this temporary setting and have the patient return every other day for observation and to remove the bridge and wash the sockets if necessary. There have been a few cases where for some reason the patient wore the bridge with this temporary setting for a considerable longer period, (in one instance three months) and upon removal for cementation the tissue against the porcelain was found in a fine condition. It is not hypertrophied, red and inflamed looking as we usually find it under porcelain which has been ground but while darker than normal healthy gum pink it shows no evidence of irritation and does not bleed upon heavy touch nor is there any exudation. Cultures made from smears from this tissue showed only the usual organisms found from smears from normal gum tissue. As to the slice preparation, it is simply an earnest endeavor to develop a preparation for proximoclusal and M. O. D. inlays without approaching the pulp closely at any point and yet have a maximum of retention. Only hard golds make it possible and they must not be made with any gold of less endurance than Ney Oro B. Tinker TT, or Rich Alloy Nos. 5 or 6. I have presented it only after two years' thorough trial and have found it good. In all cases where a slice M. O. D. is to carry more than one pontic the buccal and lingual extension as shown should be used; in longer spaces we should use three-quarters for safety. In other words in using the slice preparation and porcelain root extensions sound judgment coupled with thorough preliminary diagnosis are essential. It also seems to me an ideal preparation for proximoclusal inlays in cases where decay has just started proximally.

THE GOAL OF DENTAL EDUCATION

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IN ORDER to fully appreciate recent developments in dental education it is necessary for us to review briefly the early history of our calling. Twenty-five hundred years ago dentistry was not a distinct profession but one of several specialties in the highly respected art of medicine. In the great Egyptian civilization of the seventeenth century before Christ, the dentist was regarded as the blood brother of the internist, the oculist, and other medical specialists.

Eleven centuries later, at the time of Hippocrates, the great "Father of Medicine," oculists and dentists were still specialists in medicine. Dentists took, with other specialists, the fine Hippocratic oath, which placed them on honor to practice always "for the benefit of the patient" and "with purity and holiness." This same fact is of great significance to us. Hippocrates is still a mighty name in medicine. His "undying importance rests upon the method and really great principles which he introduced for all time into science especially into practice. He lives and will continue to live the immortal model of medical thought, and still more of medical practice, so long as medical science itself exists" (1).

The Alexandrian surgeon operated on the teeth as on any other part of the body. In Roman times Aulus Cornelius Celsus, the authoritative writer on medical subjects, describes current practices in treating diseases and injuries of the teeth. The fundamental conception of the dentist is still that of a doctor a *learned man.*

In the seventh century A. D. after the Saracen invasion of Europe, both dentistry and surgery fell away from medicine, the result of a curious aristocratic doctrine of the Arabians which forbade a physician to do anything with his hands. For some centuries after this surgery suffered humiliating loss of caste. In the thirteenth century Albucasis endeavored by his writings to restore it to its ancient dignity. In his exhaustive work on general surgery he devotes a large part to operations on the teeth. It was left to comparatively advanced scientific thought to isolate the mouth region from the rest of the body!

Early in the fourteenth century surgery had fallen into the hands of barbers, farriers, and swine doctors. Medicine, too, had suffered a decline throughout the Middle Ages, and had finally descended to the monks and to itinerant mountebanks. Fortunately the old Hellenic culture had not quite died out; a gleam of it still shone here and there in a struggling university. With the influx of learned Greeks from Constantinople, following the Turkish invasion of 1450, medicine was rapidly restored to its old position of importance.

To a group of Roman scholars, Vesali, Ingrassias, Fallopia, and Eustachi, surgery owes much of it rehabilitation (2). The last two in particular devoted much intelligent study to the teeth. We have for the first time a really intelligible and useful description of these organs. This paves the way for the publication, twenty years later, in 1581, of the first work

explicitly on the structure and diseases of the teeth. Its author, Urban Hemand, was a general surgeon. Despite these learned names, however, surgery was long degraded by its association with the barbers, whom it was unable to shake off. "The surgeons of Paris," writes Snell (3) in 1832, "who since the time of Lanfranc, had constituted a particular college, had before the commencement of the sixteenth century, made re-iterated complaints on this subject, to the faculty of medicine; the only result of which was that they were allowed to enjoy a certain pre-eminence over the barbers, on paying sixteen sous annually to the said faculty. Things became worse, however, soon afterwards, the physicians of Paris having, in 1505, concluded a treaty with barbers, by which the latter were, on certain conditions, admitted members of the faculty, and dignified with the title on Tonsores Chirurgici, instead of Barbitonsores, by which they had previously been known. Ten years afterwards, Barat, the President of the College of Surgeons, by addressing his complaints to the University of Paris, instead of the Faculty of Medicine, obtained for the surgeons a partial emancipation from that state of vassalage in which they had hitherto been held by the physicians; and the college was soon afterwards acknowledged as a learned institution, with the privilege of constituting its own Masters, Bachelors, Licentiates, and Doctors in Surgery. These privileges, in spite of the frequent and vexatious opposition of the Faculty of Medicine, the surgeons still continued to enjoy; so much so, that in 1596, they issued a decree, by which the barbers were compelled to call in a sworn surgeon, in every case of importance, and to confine themselves entirely to the most trivial accidents; but, as the majority of those which befall the teeth, are commonly considered in that light, it is probable that the barbers of this period were still the principal dentists of the age. We hear of an oculist about this time, as distinct from a general practitioner in surgery, in the person of Bartisch, oculist to the Elector of Saxony; but of a professed dentist, no mention is hitherto to be met with."

Dentistry, it will be seen had fallen on bad times. But with the great advancement in science of the late sixteenth and seventeenth centuries, a change was effected for the better. It is once more in the best practice, we must particularly note, a field of medicine. I quote again from Snell (3): "The advancement thus rapidly effected in natural philosophy soon extended itself to medicine; and the accumulation of new facts, in every branch of this extensive science, was, in a short time, so great, that a more especial attention to a few departments alone became indispensable, in order to excel. Hence there arose, among medical men, a more minute division of labor than had been known since the time of the Egyptians; and this minute division of labor was, in its turn, a cause of still greater progress in the several departments of medicine, by concentrating the energies of individuals to particular branches, instead of dividing them among the whole. It was at this period that the dental art began to be exclusively cultivated by a certain class of medical practitioners, and that we now, for the first time, meet with the appellation of surgeon-dentists, a title given as early as 1622, to Gillies, and others, in France, but not for many years afterwards fully established. * * * It was not until the year 1700, that persons destined for the profession of dentists in France, were compelled to undergo a regular examination; and it is from this period, perhaps, that we must date the establishment, in modern times of the dental art, as a distinct branch of medical practice."

During the eighteenth century great progress was made in restorative dentistry, as well as in fundamental anatomical research. France continued to contribute men of note, for instance

Pierre Fouchard, author of the first complete work on dentistry (1728) and "the founder of modern scientific dentistry." This book, the German Philipp Pfaff'f Abhandling von *der Zahnen* (1756), and John Hunter's "Natural History of the Human Teeth" (1771) form three important landmarks in the history of dentistry. John Hunter was essentially "a great all-round biologist like Haller and Johannes Muller, and, with Paré and Lister, one of the three greatest surgeons of all time. Hunter was the first to study the teeth in a scientific manner, and the first to recommend complete removal of the pulp in filling them. He introduced the classes cuspids, bicuspids, molars, and incisors, enlarged upon dental malocclusion, and devised appliances for correcting the condition" (4). His "*Practical Treatise on the Diseases of the Teeth*" initiated in England a new epoch for the dental art which, abandoning its blind empiricism, began to take its stand on the basis of rigorous scientific observation (5).

Contemporaneously, as always, there were quacks in great numbers. Baas writes of Germany in the eighteenth century, "the cosmetic art of dentistry, an art then, as to some extent at the present day, the field of charlatans, enjoyed much cultivation." He then enumerates six men who to his knowledge were *not* charlatans! In fact, Baas, states that John Hunter "did not scorn *even* the subject of dentistry!" The significant point for us is that, however out-numbered by the quacks, there were still men of the surgeon-dentist type who held to the straight and narrow path of scientific study.

The French Revolution with its general lowering of barriers, played havoc with dentistry. "Short-cut men" sprang up throughout Europe. America, too, had its share of them. We have little early record, in fact, of the scientific type of American practitioner; we have many accounts of the skilled mechanician, notably of the erstwhile silversmith, Paul Revere. The first forty years of the nineteenth century in America were marked by the continued development of this type of skilled technician. The only training afforded, beyond the apprenticeship to a practitioner, were four or five months' lecture courses in medical subjects, such as anatomy, physiology, and materia medica. Most dentists practiced without medical training and without degrees. Naturally, the emphasis fell on technic. Turner (6) points out: "As more was known about these matters than about what may be called the vital relationships of dental operations, and as mechanical skill was necessary to the actual practice of dentistry, it is not surprising that mechanical training should have taken so large a part in dental education. As this was the greater part of the course, it is natural that it should have become its most important part, and that dentistry should come to be regarded very generally from a mechanical point of view. Furthermore, as the empirical method prevailed very largely even in medicine, it is not difficult to understand how dentistry, consisting as it did of methods of practice learned by experience, should have followed similar methods in its education efforts. * * * The impetus of this development of mechanical ideals was so great that it has extended even to the present day. These mechanical ideals underwent great elaboration from 1875 to 1890, for during this period crown and bridge work entered upon a period of rapid growth. The evolution of orthodontia during this period was also distinguished by the infinite variety of mechanical appliances which its votaries produced. This may be truly said to have been the mechanical age in dental education, and the early empiricism was continued by the fascination of the study of mechanical arts."

This quotation carries us beyond the establishment, in 1839, of the first dental school. The University of Maryland

had been asked by two prominent practitioners, Drs. Hayden and Harris of Baltimore, to establish a course in dentistry, and with lamentable lack of foresight, had refused. Dissatisfied with existing conditions, and failing in this undertaking, Hayden and Harris finally brought about the establishment of the Baltimore College of Dental Surgery.

This sharp cleavage has been called a "crime." Unfortunate in its consequences it certainly was; but it was a natural outgrowth of the chaotic scientific conditions of that time. So close a connection has this fact with the subsequent development of dental education that I must digress for a brief account of such conditions, especially in medicine.

Medical training then and later was haphazard. There was no such volume of medical knowledge as was opened in the latter half of the nineteenth century with the flowering of bacteriology and the other biological sciences. As late as 1860 Dr. Oliver Wendell Holmes reminds the Massachusetts Medical Society that medicine was called, at a meeting of the British Association, "the withered branch of science." It was a two or three-year course with no preliminary requirements except a high school education, and that, in the private schools was often blinked. These early schools, established first to meet a real educational need, were soon augmented by many others seeking only profit. In such schools clinical instructors often paid down a tidy sum for the privilege of holding chairs. This they expected to get back in the benefit to their private practices from such a teaching connection! It was often returned many times over, as the college grew, in student lecture fees, and in referred cases. There was a dearth of trained scientific teachers and a very little laboratory work. Often clinical men taught all the science offered. These schools continued to spring up as late as 1900.

Meanwhile, however, there had been a growing sense, among practitioners trained in the university medical schools and among scientists, that the situation was intolerable. Huxley's ideal had been steadily permeating the best medical thought, which, as always, was found in the few university schools then contemporaneously developing. Their disinterested efforts finally led to a great house-cleaning, under the Carnegie Foundation, with Abram Flexner at the head of the survey. The publication of the Foundation's report spelled doom for the proprietary schools. More than fifty per cent of them disappeared within a year. I need not enlarge on the sweeping results of this published report to medical education. It is too well known to require comment.

Dental education from 1839 took the same general trend. The early private schools, established to fill a real need, were rapidly added to, toward the close of the century, by schools set up purely for profit. The temptation to teach with an eye to the owners' pocketbooks rather than to the advancement of science grew overwhelming. With a continually growing need for dentists the number of these schools increased, and the standards fell lower and lower.

Kaufmann (7), summarizes the situation thus: "The dental profession of today is menaced by a great danger, namely, *commercialized education,* which, imbedded in money greed, rotten with inefficiency, bankrupt in great teachers, steeped in self-appointed authorities, and lacking in examples of spiritual leadership, infects the hand that feeds it."

It is not to be inferred that all proprietary schools have deserved this scathing indictment. Between 1839 and 1890 they may be regarded as filling a need in the evolution of dental education. After that time the age itself became more than ever commercial. In the last thirty years we find the extremes of rottenness described by Kaufmann. With an increasing demand for dental service

came larger opportunities for profit. The only ideal was that of the dollar. Let me give you some plain facts which will speak for themselves.

Such schools were usually located in large centers, where the population could be levied on easily for new victims, both students and patients. Usually a few men got together to organize such a school, formed a stock company, elected themselves to the various chairs and assumed the initial financial outlay. Their chief concern was to enroll the largest possible number of students, whom they proceeded to bleed at every turn.

Naturally, their entrance requirements were of the lowest. Credentials, except in a few states where matriculation was in the hands of the state, were seldom challenged. In many instances students were helped to evade the minimum standard requirements.

Not long ago a high school officer in Chicago was indicted for having sold some 3500 diplomas. Most of these were used by the buyers for entrance into various professional schools.

With such practices current in procuring students, you can imagine the curriculum standards. Nominally they adhered to the required minimum; actually the work was often below high school grade. The schools themselves were without supervision and took every advantage of this license.

In one commercial school of about six hundred and fifty students four sciences were taught by one underpaid instructor who had no college training in any one of them. Within a few blocks is one of the best medical schools in the country. This teacher had never crossed its threshold. He was not a member of any biological or scientific society. He received the magnificient stipend of $1600 a year. Students, it was understood in this institution, were always to be passed! A condition, said the Dean, must never become a failure. Technical instruction fared but little better. The practical phases of dentistry, however, were looked after with somewhat more care, presumably to insure a better income from the infirmary fees. This was usually a large source of profit. Students were put to work as early as possible. In one school orthodontia patients were treated by freshmen—upperclassmen disliked the work!

Equipment and buildings were usually below par. Often rooms which should hold fifty or sixty students, say, were forced to care for two hundred. Science laboratory facilities were always meager; technical laboratories were better, but were in many instances inadequate.

Naturally the products of such a system were largely mediocre or worse. From their ranks came most of the recruits for advertising offices and other charlatan practices. To even the best student an education was nothing more than a bad start.

To revert now to the entrepreneur faculty: To begin with they charged each student a fat annual fee. They made a profit on his books, instruments, and supplies. They set him to work for them in the infirmary at the earliest possible moment and kept him at it until graduation. Sometimes the faculty owned the building and collected high rent for it. Often they paid themselves interest on the mortgage. They voted themselves large salaries. One man for three hours' teaching a week drew a salary of $5,000. Besides these minor perquisites, there were stock dividends from the surplus income. One school, I happen to know, had above all expenses, a yearly dividend of $60,000. One faculty member has been heard to boast that his school once brought him $30,000 a year profit. With such standards prevailing in his locality small wonder that an honest dentist once declared to me that dentistry thereabouts was only five per cent efficient.

Again the saving phase of an apparently hopeless trend of development has

lain with the universities. In 1869 Harvard took the step, momentous to the future of dentistry, of establishing a dental school. Three years later it graduated its first class, with Dr. Oliver Wendell Holmes as the speaker of the day. His words are pertinent to our discussion:

"This commencement of the dental school has a real significance, though it makes little show, and does not appeal to any vulgar interest. It publishes the fact that a new pursuit has been assigned its place among those chosen professions which a fully-organized educational institution may fitly take in hand, and provide for teaching. And you may be assured, that, before our old university would take such a step, its governing boards had satisfied themselves that the time was fully ripe for it. The dental profession had achieved its success, and had won its place in the estimate of the intelligent public, before its teachers were asked to share the labors and the dignities which belong to the faculties of this great institution. * * * A few generalities are all that can be attempted in a discourse like this; enough to give some little idea of what the dental profession has grown out of, and what it has grown to; a few hints to make us feel more keenly its importance; a picture or two of old superstitions and fancies and barbarisms to contrast with the enlightened knowledge of our own time; a brief mention of some of the leading modern improvements in the scientific and practical departments relating to the teeth; an explanation of the causes which have kept the dental profession from receiving the recognition it has a right to claim; and a vindication of its title to the regard of the community, and to a fair representation of its teachings at the great seats of learning." Further on Holmes alludes to "the branch of the medical profession to which this graduating class has devoted itself." At the close of his address he states, "your profession, young gentlemen, is now an accepted province of this great and beneficent calling (medicine).* * * Harvard University is doing all it can do to recognize the value of your profession to the community; and it does that at the time when it is making the most strenuous efforts to place medical education upon a basis worthy of a branch of knowledge so complex, so vast, so all important to mankind."

I quote this at length because it leaves no doubt as to the status of dentistry in the regard of this great thinker.

Other universities soon followed the lead of Harvard, Michigan established a dental school in 1875, Pennsylvania in 1878. In 1921 two-thirds of all the schools were integral parts of state or endowed universities. The list is still growing.

In 1884 various schools of all types organized the National Faculties Association of dental schools for the purpose of standardizing and regulating dental education. This body, sincere in its purpose, did a great deal toward bettering conditions. There was a great deal to be done. At no time in its former history has dental education moved steadfastly toward a clearly perceived goal. Quite the contrary. Like all other human institutions it has muddled along in very human fashion with, as one looks back, an astounding lack of vision, even of foresight. As late as 1884 it was necessary for this Faculties' Association to take very elementary steps toward betterment. At its first meeting it "abrogated the prevailing custom of allowing five years' practice to be substituted for one session of college work, recommended the general adoption of a graded curriculum of two years, recommended the subjects of instruction, and declared itself in favor of an examination upon the rudiments of an 'English education' for all candidates for admission. In 1889 a three years' course of not less than five months each was adopted, to go into effect in 1891-92. Six months' sessions

were approved in 1894, and extended to seven months' in 1899-1900. In 1901 a four years' course was projected for 1904-05 to accommodate the rapidly increasing subjects, but in 1904 this was rescinded in favor of a three sessions' course of thirty weeks each, as it was decided that the adoption of a four years' course had been a little premature. The four years' course went into effect in all the colleges of the country in 1917.

"The National Association of Dental Faculties advanced the preliminary educational requirement to admission to a high school in 1897, and to admission to the third year of high school in 1900. In 1907-08, three years of high school were required and now for several years past, a completed high school course or its equivalent has been necessary for admission to dental colleges. Thus will be seen the influence of this association in lengthening the dental course and in prescribing preliminary education standards." (Dr. Turner, ibid.)

Naturally, the dentists most commonly produced under this regime were of the "skilled mechanic" type—too often not skilled at that. Talbot calls them "tooth carpenters." If all of the mechanical work done were of first grade the results would be less deplorable; but with graduates of such diploma mills as I have described at work on a helpless public, the consequences have been shocking. Dr. Talbot (8) veteran dentist of the physician type, and dauntless fighter for a scientific dental education said:

"From time to time, in the past thirty years, I have repeatedly called the attention of the profession to the fact that modern dentistry is producing more disease than any other cause. The profession is beginning to realize the truth of this statement. Since the first dental college was established, there gradually has developed a method of practice of mechanics regardless of pathologic results. The method of practice, at best, has benefitted the individual patient only for the time being. On the other hand, after operations are performed, disease has followed in almost every instance.

"Our present method of treatment has not benefitted the race as a whole. Decay of the teeth and deformities of the jaws have increased from generation to generation until at the present time hardly a child under twelve years of age can be found free from tooth decay and deformities of the teeth and the jaws. Since our present methods of procedure are faulty, we must resort to radical changes in treatment and devote our entire attention to preventive measures.

"The wonderful progress made in medical teaching in the last fifteen years should be an incentive for the better education of the dentist. * * * These changes so necessary to medical schools, are just as necessary in the dental school. * * * I have held for many years that the dental school could not make a professional man out of the student by the present method of teaching, even if the course should be extended to six or eight years. There are two grades of dental colleges in the United States; those that are an actual part of universities or colleges and those that are not. Those that are a part of universities have nothing to do with the matriculation of students. Those that are not, have everything to do with the entrance requirements of students. There is an unwritten law among the dental schools that all students entering must be either graduates of a high school or they must successfully pass on examination covering the average high school requirements. The result is that a large percentage of the students entering the dental schools other than those connected with universities or colleges have not an education equal to that of our common schools. It is possible that the dean can explain how these students enter."

Realizing the hopelessness of the general situation, most of the University schools had one by one withdrawn from

the National Association of Dental Faculties. Harvard was the first to go. In 1908 six of them, Harvard, Pennsylvania, Michigan, Minnesota, Iowa, and California, formed a group—the Dental Faculties Association of American Universities, with nominally the same ideal—the disinterested advancement of scientific dental education. This was the first organized movement to oppose the shockingly commercial trend of proprietary dental education.

The first steps agreed on by this body, were: 1, the necessity for a survey of dental education; 2, the need for lengthening the course. Impetus was given to both movements by Dr. Hunter's momentous charges against American dentistry in 1911. One school initiated a four-year course in 1915; others followed in 1917. Since its organization the University Association has bent it energies toward raising entrance requirements, standardizing the course, lengthening the course—it is now 5 years in many universities—and otherwise establishing the claim of dentistry to rank as a learned profession.

Owing, perhaps, to a lack of vision, or in some instances, to self-seeking, several prominent educators and practitioners have put themselves in the class of educational acrobats. One such man in a single paragraph advocates a thorough knowledge of medicine and surgery, and deplores any attempt to lengthen the course of study. In the same article this writer contends that such trifles as college biology, physics, and chemistry, should be eliminated from a medico-dental curriculum; the time thus saved should be given to technic and incidentally to learning the bacteriology and pathology of clinical diseases and their proper treatment! How this is to be done without fundamental training in biology he does not stop to explain. University educators might well hesitate to consider any advice on similar subjects from such an irresponsible source. The same man in 1913 gives cordial public support to one of the best known proponents of a joint medico-dental course. Eight years later he publicly advocates a *reduction* of the preliminary training in order to increase the supply of dentists! In the meanwhile he states in a professional journal that the *far-seeing* members of the profession have come to realize that our only future hope lies in profound biological study, and in the study of nutrition. Why he should a few months later clamor for an increased supply of the tinker-type it would be interesting to have explained. "Some" tumbling!

That the universities have always recognized their responsibilities is substantiated by the correspondence of the Dental Faculties Association of American Universities. The following quotation is from a letter sent by the chairman of the Educational Committee to all university presidents, March 26, 1913.

"I want, briefly, to call your attention to a state of affairs which can and must be remedied by state or endowed universities. * * * At the present time there are only six state (or endowed) universities, maintaining dental schools and something like fifty schools are in the hands of private parties. Dental education is more or less strangled in the prevailing commercial atmosphere. Preliminary requirements are too low, and often ignored. The professional standards are generally low in these schools. There is no elimination of the unfit, either before or after entrance. The profit element predominates. Hence all modern weapons are employed to keep intact such institutions. Societies and various organizations, even state laws are manipulated by the mercenaries for the benefit of this unscrupulous element. It makes it rather difficult for the few idealists to realize in any way their ideals. There is just one remedy available under our present form of government and that is to substitute for the commercial or private schools, those that

are under state control (or otherwise endowed and not dependent upon students' fees for maintenance)."

Replies from ten of them are herewith recorded:

"I have received and read with attention your letter of the 26th. It has long been my belief that instruction in dentistry should be included in the medical school program, and that it should be treated as an elective course based upon a thorough knowledge of anatomy, physiology and biological chemistry. The difficulty, however, is to persuade members of medical faculties of this.

"I am referring your letter to the dean of the medical faculty."

"Your letter of March 26 to President ..... concerning the status of education in dentistry in this country has been referred to me. I agree entirely with what you say concerning the status of dentistry in this country and feel that the standing of dentists of our country cannot be successfully received unless their education is placed upon a thoroughly scientific university basis. In my intercourse with the average dentist I have been reluctantly forced to realize that he regards himself fully as a skilled artisan. I imagine that the remedies you propose are the only available ones."

"I think there will be general agreement in the feeling that the standards of dental schools ought to be raised, and I think it is not at all improbable that the Carnegie Foundation will go into the investigation of this field, somewhat as it has into that of the medical schools; but, in any case, those of us who believe in good educational standards, must sympathize with anything that the dental schools themselves can do to raise the standards and to better the tone of the institutions in their charge."

"I have your interesting letter of several days ago regarding the establishment of dental schools in state universities. I think the point you make is a distinctly important one, and that there should be careful state supervision of dental instruction."

"Your letter of March 26 in regard to the profession of dentistry is received. I am in full sympathy with all that you say. As a coincidence, a short time ago I received a joint letter from three high class dentists in ..... making a plea, not in your language, but for the same ideals which you advocate. * * * When in the future we establish clinical medicine in connection with this university and dentistry is provided for, I shall hope that we may have the work established on the highest plane."

"I have your letter of March 26 relative to the profession of dentistry. I sympathize with you heartily in your efforts to put this upon a higher plane. This city, as well as all other American cities, is overrun with incompetent dentists who impose upon the credulous public. I hope you will be successful in your worthy undertaking."

"I am in receipt of your kind letter of March 26 relative to the status of dental medicine in the United States. I appreciate what you say and am in hearty agreement with your statements. I do not know that we can do anything to forward this work, but I assure you you have my entire sympathy in this movement and I shall be glad to do anything that may come within my power."

"I am in entire sympathy with you in the work you are undertaking to do. I shall be glad to co-operate with you in any possible way. Please command me fully."

"Your favor of March 26 is just at hand. I am heartily in sympathy with your argument for the standardization of dental colleges in the United States."

"I have your letter with reference to the educational and professional standards of dentistry. I quite agree with all you say. * * *

"To my notion, all of these professions should be as rapidly raised to high educational standards and requirements as

educational conditions will permit. Too many incompetent and poorly trained practitioners in all of these fields are preying upon the public. I am always glad and ready to do anything I can to change these conditions."

I could cite several other instances of as flagrantly inconsistant policies. However, suffice it to say that we have had too many men of the type Dr. Holmes calls "practical" to deal with. "The statesman," he writes, "who works in policy without principle, the theologian who works in forms without a soul, the physician who, calling himself a practical man, refuses to recognize *the larger laws which govern his changing practice,* (the italics are mine) may all find that they have been building truth into the wall, and hanging humanity upon the cross."

You will see that there has always been determined opposition to any larger program. "It is so hard," Dr. Holmes remarks, "to get anything out of the dead hand of medical tradition." This is equally true of dental tradition, or of any other. Yet we have gone a long way toward the ultimate goal. The Dental Educational Council of America has made the pre-dental year, adopted by the Dental Faculties Association of American Universities and the regents of the State of New York in 1919, a minimum requirement beginning 1926, for possible Class A rating. The professional course will then be uniformly four years. The Carnegie Survey is an accomplished fact; we are assured of future progress in the right direction, the "dreamers" are now busy with curriculum building. Dean Lyon calls it their "favorite indoor sport."

This brings us to a consideration of the final goal. Ideally, of course, this is a return to the ancient status of a specialty in medicine. This ideal is supported by an imposing number of thinking men in both professions. Locally there are Dr. Henry L. Ulrich, Dr. J. P. Schneider, and, of course, Dr. Charles H. Mayo.

"It may be idle speculation," stated Ulrich (9) in 1914, "yet it may be pertinent to wonder what would have been the result if the first efforts of dental teaching in this country had been fostered in a medical school. It was what your forbearers wanted. It is a matter for regret to many if not all that Hayden and Harris seventy-five years ago were not allowed the experiment in Baltimore. It might have come about that the degree of dental surgery would have been snugly hidden in the old time degree of medicine just as our specialists in abdominal or cranial surgery are modest in their degree of M. D. The oral surgeon is as much a specialist in his field as is the laparotomist. They work, too, on one common subject. Why, therefore, should their basic training be so different? Yet they have been trained apart. Wrapt in the dream of its artisan perfection, dentistry has forgotten its noble origin and only too often it has attempted to supplant itself wholly in the soil of mechanical marvels. This is a strong indictment, but no stronger than the one against the parent stem. Proud and haughty with achievement, it let its lusty shoot grow in woeful negligence. The dentist and doctor must again come together. Their vision of their joint function must broaden. Truly, the day is past when the dentist can hide behind the whir of his drill, and the physician sit tight between doses of salicylates."

Schneider (10) writes: "The dental teacher is aware—quite aware—of the gap that needs bridging between 'most dentists', as some one has expressed it 'who are jewelers or metal workers; who fall down grievously in their duties regarding infection; who frequently discuss, but seldom practice, asepsis,—between such men and the medically fully trained man whose adequate foundational work makes for biological reasoning as against mechanical.' To my mind

there is no hope of bridging the gap except we make dentistry a medical specialty, with all of the usual pre-specialty general medical training."

The position of Mayo in this regard is well known. He is uncompromisingly in favor of a common fundamental training.

Dr. Abram Flexner, of the Rockefeller Foundation, stated, (in June, 1920): "The new school of medicine, will, it is hoped, undertake to place training in dentistry on the same academic and scientific level as training in medicine and surgery."[1]

The noted Chicago surgeon, Dr. John B. Murphy (11) in 1916, asks, "Why should the dentist be educated in a different room from the surgeon in the essential elements—in his bacteriology, histology, biology, physiology and anatomy? He should not. It is an anomaly. The first two years, as indicated by Dr. Thornton, should be the same with the aurist, the oculist, the surgeon, the neurologist, the internal medical man and the dentist, and until this educational error is corrected there will be no correlation and no co-operation between dentistry and internal medicine."

Last November Dr. W. S. Thayer of Johns Hopkins, wrote to Dean Lyon of our medical school, "The close association of dentistry with medicine and surgery is a matter which I have very much at heart. I think it is most unfortunate that the instruction of the dentist is in any way different from that of the doctor and surgeon. Dentistry should be just as much a specialty of surgery and medicine as ophthalmology, otology, rhinology, or any of the other well-recognized specialties."

Another voice from Johns Hopkins is that of Miller, (12) who expressed himself as follows: "there is a universal recognition of a far too little appreciated fact—the medical and dental professions are not fundamentally separate, but rather branches of one art and science, which has for its aim the prevention and alleviation of human illness and suffering. Gaps in the ranks are becoming less and less, and it seems safe to predict that not many generations hence these will have disappeared."

Vander Hoof, (13) of the Medical College of Virginia, advocates strongly the return of dentistry to medicine. "This recognition," he writes, "of the grave dangers attending alveolar infections has not only emphasized in a striking manner the crying need for skillful and competent dental technic, but has served to elevate the practice of dentistry from a largely mechanical profession to a true specialty of medicine, comparable in dignity and importance to that of the ophthalmologist, laryngologist or otologist. * * * It is very evident that progress is being made, but it is equally evident that there is a hesitancy in advocating the same standards for dentistry as for medicine. It has been demonstrated, however, that dentistry is really a specialty of medicine on a full and equal footing with rhinology and laryngology, for instance, why should not the standards of the competent dentist be equal to those of the properly trained nose and throat specialist? As a matter of fact, there is, and can be, no distinction between them in their important services and contributions to medicine in general. That there has been a distinction in the past is obvious. This has been due in part to the ignorance and aloofness of the medical man as regards dental practice but in a definite measure it has also been due to the *visionless dentist* who saw only a mechanical proposition in the mouths of his patients."

An editorial cites the Great Dr. Adami, (14) Vice-Chancellor of the University of Liverpool, with whose work in bacteriology you are familiar, as mentioning the fact that in Canada where he had spent more than a quarter of a century, "a

[1]At the announcement of the establishment of the new school of medicine and dentistry at the University of Rochester.

large number of practicing dentists today are university graduates, and the profession has gained a standing equal to that of medical men. That this is as it should be," continues the editor, "must be the feeling of all who hold that dentistry is an integral part of the healing art, that as such it shares the heritage of great traditions, and that therefore everything must be done which education can do to enable its practitioners to stand on equal terms with practitioners of medicine, who shall not be ashamed to call them colleagues."

Among the dentists of larger vision are Doctors Thomas L. Gilmer of Chicago, L. M. Waugh of New York, Newton Thomas of the University of Illinois, and Dean F. B. Moorehead also of Illinois. Gilmer (15) stated: "We speak of dentistry as a specialty in the healing art, which is indisputable, then immediately contradict the statement by calling it a separate profession. Dentistry is either one or the other. If it is a specialty in the healing art, then dental education could best be obtained in a medical school. Some have always thought that this was the proper method, and the recent increased demands on us for broader medical knowledge seems to justify more fully their belief. That there are serious difficulties in the way no one can deny, but that there may be worked out a plan by which it may be accomplished seems within the range of possibilities."

Waugh's (16) presidential address before the Dental Society of the State of New York in May, 1921, is full of meat:

"The dentist of tomorrow must be much better trained.* * * It would seem that the time has arrived when organized dentistry should make certain decisions and having made them should lend the fullest moral support to measures for the betterment of dental education." (I should like to emphasize this with all my power.)* * * "Dentistry obviously belongs to the great healing profession. It is a specialized branch of medicine."

It is a temptation to cite every word Dr. Moorehead has uttered on the subject, but time forbids. I must content myself with a single expression of his point of view: "The fundamental question which we must face and answer in the premises is this: What is dentistry? What are the demands, in the light of the indictments of medical science, that are going to be made upon dentistry, and how nearly can the dentist of today meet the fundamental medical requirements that are before him at this very hour? We are not here for the purpose of placing a wreath of immortelles upon the past, or to bedeck the present with roses, but to look at this whole matter fairly and squarely. It goes without saying that our discussion is quite impersonal and in the abstract. In the first place, there must not be any less of intellect, of scientific attainment, of judgment, poise or usefulness on the part of the dental practitioner than on the part of any other medical specialist. You cannot take the mouth out of the body and place it to one side, depriving it of all its interdependencies, and assume that one type of specialist may take care of it, while another type of man shall be required to take care of another special part of the body. As a matter of fact, there are just as many correlations and interdependencies between the mouth and the whole body as may be found between the eye, ear, nose, throat and the body as a whole. The eye man, if he is a good eye man, must know general medicine and the mouth man, if he is a good mouth man, must know general medicine. One may not deny the fact that there is perhaps in many respects a greater demand made upon the dentist than upon any other medical specialist, and yet we take a high school graduate and in three years of training make a dentist out of him, while the man who was to be an eye specialist or an ear specialist must needs spend two full years in college preparation plus four years in medicine, plus

at least one year in hospital internship. Is it at all reasonable to assume that these two individuals shall have the same quality of intellect, or render the same quality of service? Certainly not! The dentist must suffer by comparison. When we have once defined dentistry, we shall be required to make a new prescription for the education of the dentist."

After all this abstract discussion it is pleasant to be able to state that two universities have gone a long way toward this ideal. Columbia University began the course in dentistry with a requirement of two years' pre-dental training; the University of Rochester is inaugurating a school of dentistry with a requirement of three pre-dental years.

A great to-do has been made over the possibility, magnified into a positive fact, that if this program were carried out we should have a great dearth of dentists. Specious arithmetical juggling has purported to show that with so many hundred thousand cavities yawning to be filled by so many thousand dentists, we must take no chance of reducing the number of dentists, even, it is to be inferred, of bad dentists. An ill-prepared dentist of course does more harm than good. But, argument aside, there is no need for a diminished amount of practical dental service under the new plan.

As Thomas (18) writes: "Let it be said that there is enough educational intelligence in the colleges of dentistry in the United States to render this fear (the fear that the course will become impossibly long) nothing more than a specter. No advocate of better education for dentists reckons in such terms surely. Readjustment of the whole scheme of medical education as it is related to the specialties may well be a result of the dental approach to the problem. In beginning such a movement dental educators might be accredited with the sanest thing medicine has done since it consented to the Dicta of the Carnegie investigation. Dentistry would not only save itself but invoke the gratitude of future schools of medical specialties. And this is being said with full consideration of such opposition as might arise within the colleges of medicine themselves."

This is an excellent statement of the case. Several years ago the educational committee of the University Faculties Association of American Universities was at work on such a plan. Today several joint committees from the medical and the dental schools are at work on it. Dentistry and medicine share with other professions the keen "job analysis" in which Universities are now actively engaged. It is not too early to predict that out of this may ultimately come a group of highly trained medical and surgical specialists in the oral region, under whose direction will function larger numbers of highly skilled technical men. The former group will be our descendants as a profession, with a fuller development of what we call dentistry. There will be fewer of those. On the other hand, specialists in the various phases of dental technic can be trained *in much greater numbers than at present, and in a much shorter time.* These men should work under the direction of the professional men, and should have a different legal status. Economic pressure is now too severe for the unnecessary extension of a man's preparation for life. Concern for the welfare of mankind compels us to organize a course which will furnish a maximum equipment in a minimum time.

We need now and in the immediate future a very much wider discussion of our educational policies than we have had. The Carnegie report will bring to the attention of the public, and its representatives, the legislatures, and best of all, to the Universities, the real status of dentistry. Moreover, attention is being directed to the necessity of revising the medical curriculum. In its last report (May, 1922) the Council on Medical Education of the American Medical Association brought this matter to the

front. It seems that both medicine and dentistry face a reorientation. When the universities have analyzed the situation thoroughly we may hope for a reconstructed program, in which dentistry will be treated, among other specialties, with due regard to its importance.

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REPORT[1] OF THE EDUCATIONAL COMMITTEE OF THE MINNESOTA STATE DENTAL ASSOCIATION

(Read before the Minnesota State Dental Association, St. Paul, Minnesota, February 7, 1923)

THE committee on Dental Education was appointed for the purpose of ascertaining to the best of its ability the trend of dental education at the present time, to acquaint the membership of the state society with its findings, criticisms and recommendations if possible. In making this report, the committee realizes at the outset that a report on dental education can never be complete, but wishes to submit the following as its deliberations and findings:

The committee wishes to state that in the pursuance of its task it has interviewed students, educators—both dental and otherwise, acquainted itself with current literature on the subject, and endeavored in every way to preserve an unbiased and unprejudiced frame of mind in its investigations.

Your committee reports that in common with other professions, dentistry is passing through a stage of readjustment as pertains to its relationship with society in general and with other professions in particular. This has given rise to grave differences of opinion as to the present status of dentistry as a profession and as to its responsibilities of the future. The academician in our profession is

[1]This report was passed with only one dissenting vote.

aligned against the mechanically minded man, and the idealist is, as ever, ardently opposed by the practical man; out of this *must* come a common ground of benefit to dentistry itself.

Your committee believes that dentistry for its own good and proper development must remain, as it is today, ostensibly and in reality, a part of medicine, yet nevertheless responsible to itself alone and controlled by itself in its entirety. To do otherwise would sound the knell of the initiative and development within dentistry as a separate profession that has long since placed American dentistry at the peak it now occupies.

There is an apparent lack of comprehensive knowledge of the fundamentals of dentistry and a proper appreciation by all of what these fundamentals should be. It is unfortunate that dental educators and the so-called better minds in the profession are not more willing to acquaint the members of the profession with their deliberations and findings, which should give us a more definite idea of what constitutes the fundamentals in dentistry. Hand in hand with a lack of knowledge of fundamentals is the lack of sufficient training of the dental teacher and a neglect of a more practical application of instruction in dental teaching.

Your committee further believes that teaching methods could be greatly improved, time conserved, and better correlation of the various departments of dental teaching be secured if some manner of training for dental teachers could be devised.

Your committee contends that a dental course of five years, that is, one predental year and four strictly dental years, should not at this time be lengthened. Loss of time by the students due to present faulty dental educational practices as well as the economical problem involved support this contention.

Your committee refers among other things to apparent lack of standard methods of teaching pursued by some of the members of the various groups or departments of a dental college, and often the lack of responsibility on the part of some members of a faculty in meeting their duties promptly and faithfully.

Your committee recommends that in a broad sense, full responsibility for any department in a dental college should be vested in a definite department head, permanent or otherwise; believing that the responsibility for a staff or group should be positively and definitely placed.

The committee further recommends that the faculty of the University of Minnesota College of Dentistry invite the members of the committee on dental education to attend the regular faculty meetings and the meetings of the various staffs to more fully acquaint the members of this committee, and through them the members of the state society, with the methods pursued by our college.

Respectfully submitted,

Signed: W. A. GREY, *Chairman*,
F. M. OWENS,
H. H. CARLSON,
B. G. DEVRIES,
W. D. VEHE.

INVESTING ON THE INSTALLMENT PLAN[1]

A DENTIST in a small town in Pennsylvania, with the best of intentions regarding the saving of money to send his boys through college and to provide for his own old age, could not seem to make much progress at it. His experience was like that of many other professional men. When he bought securities that were offered him by convincing salesmen or through alluring circulars he found that he had been nothing but a "sucker" and had lost his money. So, after a few experiences of that kind he decided that he would buy no more promotion stocks, but would stick to the issues of established companies about which he knew something.

Then there came to his attention the announcement of a house that sold such securities on the installment plan. That suited him exactly, for it not only would give him the kind of securities he wanted but it would help him to make regular savings. He had found that he needed some fixed obligation to meet to stimulate saving. He opened an account with this house and made a substantial first payment on a list of high grade stocks.

That was in the summer of 1921. Before the end of the year his stocks began moving up in the market and this gave the dentist a definite feeling of satisfaction with his purchases. It helped him to enjoy the thrift which he had to practice in order to meet his monthly payment. He felt that at last he was on the right road to accomplish the things he desired.

But before he had made his final payment and secured possession of his stocks he received word that the house had failed and that a receiver had been appointed. At first the dentist did not know what that meant, but later he realized that he had been dealing with a bucket shop, which did not buy the stocks ordered by its clients, and because of the advancing market could not buy them later at lower prices when the time for delivery approached. In other words it had been gambling against his order and had lost. But he lost, too, for the house went into bankruptcy with practically no assets left.

Again his good intentions and his accomplishments in saving had come to naught, but his satisfaction with the installment method of buying securities was not lost. He was still convinced that it was an excellent method for him. And when, not long after, he received a circular from another house which sold securities in that way, it still made a strong appeal to him. But this time he was going to make sure regarding the character and stability of the house. He had learned an important lesson in investing. This time he took the circular to the president of a local bank and asked him if he would find out something about the house. Then he told the banker something of his previous experiences.

This banker, who knew the dentist well, asked him why he had not come to him before. He said he did not know this house and was not going to bother to make inquiries about it; that if the dentist wanted to buy the stocks listed in

[1]Reprint from *The World's Work*, March, 1923.

the circular, which were good stocks, he, the banker, would order them for him, pay for them, have them delivered to the bank and the bank would hold them as collateral and let the dentist pay for them just as he would pay the house. Then there would be no question about the dentist getting the stocks when he had completed his payments. They would be there in the bank waiting for him.

Since then this dentist has acquired a good many of the best dividend paying stocks in this way and he now feels certain that his problem of saving and investing has been solved. The banker feels almost as much satisfaction in the accomplishment, and knows that he will reap a reward in larger deposits for thus helping to conserve the savings of the community.

This experience is related here because this department has received inquiries lately from several people who wish to invest regular monthly savings. An unmarried man in California wrote: "I have for investment and speculation $75 to $100 a month. Would you please advise me what course to pursue in using these funds so long as my responsibility is confined to myself alone?" A man writing from a university club in Ohio said: "I would greatly appreciate your advice upon the best way to invest $100 per month. Systematic saving is the motive behind this desire so that an income may be built for the future." From a college in Maryland came a third one: "I am a teacher, and have from $35 to $75 to invest each month. What do you think of the monthly payment plan of ——? Can you suggest reputable firms in New York and Baltimore who have similar plans for saving and investing?"

To the first two of these inquirers a savings account was suggested until a sufficient fund was collected to make a first payment on a good $1,000 bond and then an arrangement with a local bank to handle the purchases of such a bond, hold it as collateral for the balance due and accept regular monthly payments on the balance. The United Kingdom of Great Britain and Ireland 5½s due 1937 was suggested to one of them as a good kind of a bond to start with.

In answer to the third inquirer it was said that the monthly payment plan to which he referred was a good one, but that the house itself did not enjoy the best reputation; in fact, there was good reason to believe it operated at times as a bucket shop. In reply to his request for the names of reputable firms in New York and Baltimore who have similar plans for saving and investing, the names of two New York Stock Exchange houses and of a trust company in Baltimore were given him. Through these Stock Exchange houses he could buy stocks in this way; through the trust company he could buy bonds.

Outside of these two Stock Exchange houses, this Baltimore trust company, and those of the investment banking houses that sell their own underwritings in this way, there are few brokers or bankers doing a partial payment business that the Investment Editor could recommend. That indicates the danger in buying securities in this way, the danger that the Pennsylvania dentist ran into when he first started. It explains why the suggestion is made to inquirers that they go to their local banker first to see if he will not handle such purchases for them. Since the Liberty Loan campaigns there has been a more general willingness on the part of bankers to assist and advise partial payment investors. If the investor deals through them he does not run the risk of doing business with a bucket shop.

There are not as many bucket shops

now, it is true, as there were before the fatal epidemic of last winter set in, but there are still some left and when the present advance in stock prices reaches its culmination there will likely be more. They prosper when stock prices are going down and some of those who dropped out because the market went so steadily against them can be expected to get back into the business under different names. And the partial payment method of selling affords one of the best means of operating as a bucket shop, for it gives them several months in which to win their bets against their clients.

Because stocks have now advanced in price since the summer of 1921 and may be near the top of the present upward movement, bonds were mentioned to the two inquirers above who asked for suggestions as to what they should buy. The prospects for bonds continuing to go up seems better than for stocks. Upward movements in stocks in the past have averaged about two years in duration and this movement is nearing that length. It would therefore seem better not to start investing in stocks on the installment plan, with prices at present levels, unless one bought the best stocks solely for income and felt sure he would not be disturbed to see them sell lower in price.

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Editorial Department

ANOTHER COMMUNITY ASSET

In the November, 1922 number of this publication there appeared a communication from Mayor William Hale Thompson of Chicago to the meeting of the American Dental Association at Los Angeles wherein he outlined a plan for establishing a Dental Infirmary in Chicago for the care of the teeth of children. It was to be financed with funds raised by the Pageant of Progress, an annual institution, and there was in the treasury, at that time, approximately $150,000.00. With this as the nucleus, an organization was formed called the "Pageant Foundation for Children." A lot has been purchased for the erection of a suitable

building on the corner of Loomis and Monroe Streets, Chicago, overlooking Jefferson Park, a most beautiful location. The building is to house the Chicago Training School for Home and Public Health Nursing, as well as the Dental Clinic.

On February 18, 1923, the corner stone was laid by Mayor Thompson, who said, among other splendid things:

"Medical men declare that backwardness of children in the schools is due very largely to impaired teeth and the various ear, nose and throat ills that result from them. Statistics show that almost ninety per cent of the backward children are sorely in need of dental attention, and this percentage also applies to the 26,000 children who annually appear before the Juvenile Court.

"Health officers and leaders in the dental and medical professions all agree that dental care of children will go far toward improving the morals, and their physical and mental status.

"I am informed that out of every 1,000 children in the public schools less than 400 have good teeth. Notwithstanding the fact that the sanitarium dentists and health department dentists and dental infirmaries are working day and night, they could not catch up if they had 10,000 more dentists working for the next five years.

"Of the 140,000 school children examined up to November 10, 1922, by Health Department dentists, 88,000 were found to have defective teeth. Most of the defects were found in children from six to fourteen years old.

"The importance of giving careful attention to the teeth of children is grasped more fully each year by the public. The Health Department is able to provide only a few dentists for the care of the 600,000 school children, and it is not possible for them to handle more than about one per cent of this number a year. The dental school clinics are forced to turn away thousands each year. Thus, for those school children whose parents are financially unable to pay for dental attention, there is now practically no adequate provision.

"Boston has her Forsyth Brothers, and Rochester has her Eastman, while various other cities are proceeding in a more or less tentative manner to meet the situation. All of these efforts are laudable, and all are producing results. No commendation is too great for such splendid men as the Forsyth Brothers and Mr. Eastman, nor for the self-sacrificing efforts that have been put forth by many worthy men in other sections for the amelioration of the sufferings of children from diseased teeth.

"But what Chicago is doing is something entirely different. We are collecting from the community the necessary funds to establish and permanently maintain community dental service, and it is done in such

a way that the community is benefited at the time of giving the money, as well as at the time of receiving the service.

"Life is precious to everyone, but it cannot be properly conserved if the teeth of growing children are neglected. Sufficient corporate funds are not available to care for Chicago's unfortunate children, but we think we have solved the problem through a co-operative plan with the great dental colleges of Chicago. Children treated here will also receive instruction that will enable them to take the proper care of their teeth and thus reduce to a minimum the need for dental attention in their future years.

"Eminent physicians and dentists declare that imperfect mastication of food, due to broken grinding surfaces of the teeth, causes malnutrition, which is responsible for much of the listlessness and inattentiveness of school children. Illness caused by infection at the root of the tooth is a frequent reason for absence from school.

"The dentists of the country find themselves overwhelmed with the amount of dental work in urgent need of being done. There are in the United States but 45,000 dentists to care for the 110,000,000 people. They are anxious that preventive dentistry be taught in the clinics in order that the situation may be relieved and the health of the community be improved. For as the child learns to care for his teeth by daily brushing, the amount of dental trouble will be decreased.

"It is believed that eighty per cent of all dental disease may be prevented by proper home care of the mouth and regular operative treatment by a dental practitioner who understands and follows the principles of preventive dentistry.

"The Pageant Foundation will be able to treat 50,000 children a year, which will go a long way toward alleviating the present condition. The Foundation clinic will treat also the eye, ear, nose and throat diseases of needy children.

"We have already reduced the death rate from 14.1 per 1,000 population to 11.1 per 1,000, a saving of approximately 9,000 lives annually in Chicago. We have reduced the death rate from children's diseases to about one-half of what it was; we have reduced the death rate from typhoid fever to about one-fifth; from diphtheria by one-third; scarlet fever by about seventy-five per cent; consumption to about one-half; and smallpox and cholera to practically zero, but how many deaths are traceable to teeth that were neglected in childhood? It is impossible to state just what this percentage is, but it is considerable. If we reduce to a minimum the premature deaths directly or indirectly due to the eye, ear, nose, mouth and throat ailments of Chicago's unfortunate children, this city's death rate will be even lower than 11.1 per thousand, which in itself is a record to be proud of.

"Community dental service will increase the vigor and acumen of of thousands of school children and thereby promote the health of the entire community. By treating 50,000 children a year at this clinic, the taxpayers of Chicago will annually receive service that could not be bought for less than $500,000. And nobody is taxed for it. Each individual who buys a 50-cent admission ticket to the Pageant of Progress has a part in this great work and he gets his money's worth of entertainment at the same time. Isn't $500,000 worth of dental service a pretty good return on these 50-cent investments?"

The dental world can never sufficiently thank the Forsyth Brothers of Boston, and Mr. George Eastman of Rochester, for the signal service they rendered the profession and the people by inaugurating community dental service in their respective cities, nor must Mr. Julius Rosenwald be forgotten for what he did in maintaining the Dental Infirmaries in the public schools of Chicago, at a time when without his aid the work must have ceased. The benevolence of these men focused the attention of the people on the need of dental service in a way that had never been approached before, and now the movement is spreading so that ultimately many of the prevalent dental ills of the day among children will be prevented or controlled.

The Pageant Foundation is another movement looking to the consummating of this desirable end, and it is operating in a city where the need is most urgent.

NOT EVERY MAGAZINE IS YOUR MAGAZINE

This caption permits us to remind you that *The Journal of the American Dental Association* is published for your edification. It is produced from the funds created by your dues and the dues of thousands of other members of our profession.

The Editor is constantly on the lookout for material that will instruct the individual dentist in becoming a more efficient practitioner so that better service may be rendered to humanity.

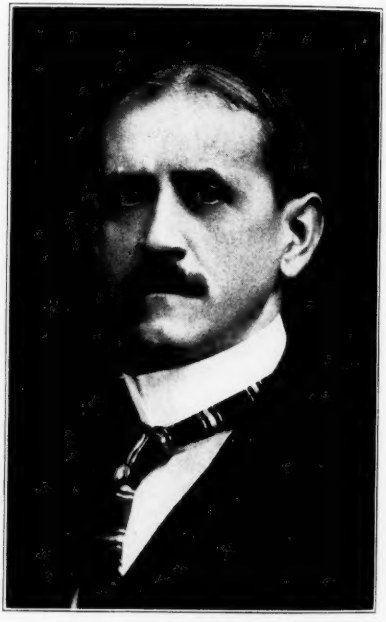
The Advertising Department is busy securing and passing on advertisements which we feel carry messages of interest to you. In fact, every advertisement appearing in our *Journal* is guaranteed. The only outside revenue to the magazine comes from this department. You can help it in its work if you will look through the advertisements before making purchases and then be sure to say "I saw it published in the *Journal*." This practice, you will find, will often save you time, trouble and money.

OBITUARY

FRANK R. CHAPMAN, M.S., D.D.S.

It is with deepest regret that we chronicle the death of Frank R. Chapman, who passed away at his home in Columbus, Ohio, on Friday, February 16, 1923. His death resulted from a two months' siege of influenza-pneumonia.

He was an intelligent, genial man, an excellent dentist and beloved by all who knew him. He always stood for the right and was a power in the State Dental Society which he faithfully served so many years as secretary, director, and member of various committees.



F. R. CHAPMAN

He was religiously inclined and a member of the Methodist Episcopal church. He was a Rotarian and an honorary member of the Xi Psi Phi dental fraternity.

Dr. Chapman was the son of Rev. and Mrs. A. R. Chapman and was born in Cleveland, Ohio, February 6, 1866. He was graduated from Scio College in 1885, receiving the Bachelor of Science degree. In 1888 he received the Master of Science degree from the same institution. In Bethlehem College he took two years instruction in civil engineering. He then entered the Ohio College of Dental Surgery, graduating in 1891, having received the highest honors the first year and a medal the second year. Here he received the degree of Doctor of Dental Surgery.

In September, 1891 he married Miss Alta Fisher, of Scio, Ohio. In 1895 he came to Columbus, Ohio, to accept a position as Demonstrator in the Dental Department, Ohio Medical University, where he taught for a number of years. He moved his family to Columbus in 1898 and began the practice of dentistry which he followed to the time of his last illness.

He was a member of the American Dental Association, Ohio State Dental Society, Northern Ohio Dental Association and Columbus Dental Society. For two years he served as a member of the Ohio State Board of Dental Examiners and was its secretary. For the past eighteen years he has been the secretary of the Ohio State Dental Society, and during the past several years has creditably conducted the Suggestions Department in *The Dental Summary.*

He was the last survivor of his own family, but leaves a wife and a host of friends to mourn his loss.

Say not that Death has robbed us of our friend
So genial, kind and steadfast to the core;
If breath has ceased, it does not mean the end;
In mem'ry he is with us as before.

IN MEMORIAM: RESOLUTIONS PASSED BY THE DENTAL SOCIETY OF THE STATE OF NEW YORK

William Jarvie

During the past year The Dental Society of the State of New York lost by death two of its fellows, William Jarvie of New York, and George H. Wilson of Cleveland, Ohio. The New York State Dental Society especially mourns the loss of Dr. Jarvie because of his long membership in the Society and his active participation in the councils of the various dental societies with which he was prominently identified. He was at all times a congenial companion, always a gentleman and absolutely devoid of affectation. He was a skilful dentist, progressive in all that pertained to dentistry and ever ready to aid his fellow practitioners. His deep interest in the advancement of the dental profession and a desire to honor distinguished practitioners in New York and other states prompted him in 1902 to offer The Dental Society of the State of New York a fund of $1,250 to be invested, the annual interest thereof to be used for the purchase of a suitable medal to be known as the "William Jarvie Fellowship Medal" to be presented annually to a deserving and distinguished member of the profession selected by a Committee to be known as "Fellowship Committee." The society accepted Dr. Jarvie's proposition and amended its by-laws by creating a Fellowship Committee. This committee has annually since 1903 recommended to the society a distinguished member of the profession. The late G. V. Black, of Chicago, was first to receive the William Jarvie medal and the last in 1922 at Rochester, New York, was Herman Prinz of Philadelphia.

Dr. Jarvie was born in Manchester, England, in 1841, and came to America with his parents when fourteen years of age. A year later he began the study of dentistry with A. A. Wheeler, of Brooklyn, with whom he continued three years when he went to Boston and continued his studies under the celebrated W. W. Codman. In 1863, he returned to Brooklyn where he practiced his profession until 1906 when he retired.

He was one of the early members of the New York Odontological Society, was one of the organizers of the Second District Society of Brooklyn, and became a member of the State Society at its second session in 1869. The State Board of Dental Examiners conferred on him the degree of Master of Dental Surgery, M.D.S.

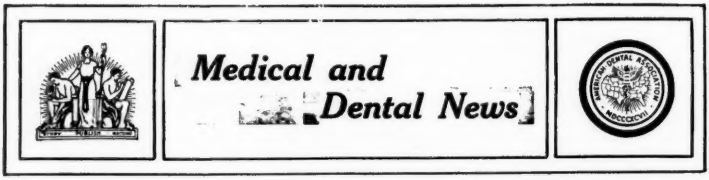
George H. Wilson

The Society regrets the death of George H. Wilson, of Cleveland, Ohio. The society at Saratoga Springs, New York, in 1918, conferred on Dr. Wilson the William Jarvie Fellowship medal.

The death of Dr. Wilson is a severe loss to the profession, particularly to the younger practitioners throughout the country. He was a recognized authority on prosthetics and his happy faculty of imparting to his fellow practitioners effectively his knowledge of metallurgy and general methods of prosthetics made him a valuable adjunct as a clinician at dental meetings.

Dr. Wilson was born in Painsville, Ohio, March 3, 1855. He graduated in dentistry at the University of Michigan in 1878, received the degree of D.D.S. Began practice in Painesville and continued until 1891, when he removed to Cleveland, Ohio, and practiced his profession up to the time of his last illness. His was a busy life as practitioner, instructor in the Cleveland University of Medicine, Western Reserve University, dental editor, author, and clinician.

A. P. Burkhart, *Chairman;* R. Ottolengui, A. C. Rich.



ILLINOIS

High School Pupils Told About Mouth Hygiene: Thursday and Friday twenty-five lectures of from 30 to 45 minutes each on mouth hygiene were given in sixteen high schools.

The lectures were arranged for by the sub-committee on health of the Association Civic Industrial Clubs Committee, of which E. G. Drew is chairman of the general committee, in co-operation with principals, faculty advisors and presidents of Civic Industrial Clubs in high schools.

Lecturers, in nearly all cases, illustrated their address with slides and films. The speakers who gave their services were secured as a result of the co-operation of the American Dental Association, and are as follows: Drs. Newton G. Thomas, P. G. Puterbaugh, Thomas L. Grisamore, J. R. Blayney, George G. Knapp, F. E. Gillespie, E. H. Hatton, G. Walter Dittmar, E. E. Graham and William O. Homer.

Morgan Park, Fenger, Pullman Manual Training School, McKinley, Calumet, Proviso (Maywood), Lane, Crane, Hibbard, Medill, Englewood, Flower, Marshall, Hyde Park, Parker, and Harrison co-operated in the campaign. Several other high schools expressed interest in the campaign but owing to the crowded condition of their schools, were unable to hold an assembly.

The object of the campaign was to teach prevention of mouth and teeth trouble by cleanliness, thereby eliminating many diseases resulting from infections from the mouth.

It is estimated that it would require 125,000 dentists in the United States each year to fill the five hundred million cavities in the teeth of our inhabitants. There are approximately 43,000 practicing dentists in the United States.

In New York city last year sixty-seven thousand children failed to be promoted to higher grades because of absence; 80 per cent of which was laid to defective teeth. It costs New York $1,037,696 to duplicate a year's schooling for these absentees. These same children will be employed by industrial concerns and a large percentage will fail of promotion on account of poor health, due to bad mouth conditions.

The sub-committee on Health is composed of Dr. Milton H. Mack, chairman, Dr. Otto U. King, and Dr. Cassius C. Rogers.

A bulletin was sent to each principal by Peter A. Mortenson, superintendent of schools, calling attention to the value of the campaign, and authorizing the principals wherever possible, to arrange for the lectures.—Chicago Commerce, February 24, 1923.

Jury Decision in License Scandal: It is reported that William W. H. Miller, former head of the department of registration and education, was found guilty, January 27, of selling physicians' and pharmacists' licenses to persons unfit to receive them, of raising examination grades and of selling questions in advance of the state examinations. He was fined $1,000. Dr. N. Odeon Bourque, head of the "Chicago Medical School," where, it is asserted, doubtful candidates prepared for the examinations, was fined $250. His license has since been revoked. Miller's son-in-law, K. A. Fries, a former official in the department, was found not guilty.—Journal of the American Medical Association, February 3, 1923.

Death Charges Face "Dentist" Who Broke Jaw: Possible charges of manslaughter today confront "Dr." Arthur Fox, 2111 North Robey Street, former shoemaker, who became a dentist by marriage, succeeding to the practice and equipment of his wife's deceased first

husband, when a coroner's jury undertake an investigation of the death of Leo Poplanske, 11 years old, 2246 Coyne Avenue.

The story told to John W. Follmer, inspector of the state department of registration and education a week ago, that "Dr." Fox had wrenched loose a portion of the boy's jawbone in an effort to extract an aching tooth, was partly substantiated by the autopsy of Dr. John J. Goltra, coroner's physician, yesterday. This showed that the boy had a broken jaw.

Fox is being held in bonds of $1,000 on a malpractice charge, which will be heard today.—Chicago Tribune, February 19, 1923.

IOWA

Lessons From Youth: A dentist in Iowa recently remarked, says Miss E. Elizabeth Reynolds, nursing field representative, that he noticed many more men gave attention than formerly to their teeth when traveling. It was so noticeable that he mentioned it to one of that fraternity the other day, who replied:

"You know the Red Cross put nurses in our schools to teach our children, so we get our lesson from the children,"—Red Cross Courier.

MICHIGAN

Chiropractor Sentenced: It is reported that F. W. Barkdall, a chiropractor, of Big Rapids, was sentenced to serve ninety days in the county jail, and fined $50, at Cadillac, January 28. Following insulting remarks by Barkdall regarding the law, the judge stated that twenty days would be added to the jail sentence if the $50 fine was not paid within ten days.—Journal of the American Medical Association, February 17, 1923.

Large Fine for Physician: According to reports, Dr. Birch J. Hamilton, formerly physician at the house of correction, Detroit, was fined $1,000 in the federal court, recently, when he pleaded guilty to violation of the Harrison Narcotic Law.

MISSOURI

Health Show: Under the auspices of the health department, a show to visualize the fundamentals of healthful living and environment will be given in the Coliseum, St. Louis, February 24 to March 4, with the co-operation of local organizations. Thirty-five per cent of the proceeds will be used for public health work.

NEW YORK

Dental Clinics for School Children: The board of superintendents of the New York City Public Schools has gone on record as vigorously opposing the recommendation of a member of the board of education that dental clinics in the schools be abolished. The superintendents recommend that the twenty-one existing clinics be continued and that other clinics be provided in centrally located schools for such children as otherwise would receive no treatment. They also recommend that the work be carried on by paid dentists appointed by the department of health.—Better Times. New York City, February, 1923.

NORTH DAKOTA

County Health Service: The International Health Board is offering $2,000 to any five counties in North Dakota that can raise a budget of from $8,000 to $10,000 for a full-time county health service.—Nation's Health, Chicago, February, 1923.

OHIO

The Child Health Demonstration which is being conducted in Mansfield and Richland Counties by the National Child Health Council has just completed its first year. Among the accomplishments of the year are the taking of a health census of Richland County; the operation of three health centers with consultation service, with an enrollment of 374 well children; an increase in the number of public-health nurses from 4 to 12; inspection of over 6,800 children by nurses since the commencement of the school term; the opening of a clinic for indigent children by the staff physicians of the general hospital; a successful four-days' institute on methods of teaching health held in co-operation with city and county teachers; the opening of an extension course in health work by the Kent Normal School; the organization by the teachers and pupils of a junior health department in the schools; and the institution of year-round supervised outdoor physical training in the playgrounds and in connection with the rural schools.—Mansfield, Ohio, News, January 21, 1923.

WISCONSIN

A health show will be conducted in Milwaukee during the week of April 21-28, under the auspices of the state board of health. The exhibits shown at the Chicago Pageant of Progress will be on view. Any profits from the exposition

will be used to promote child welfare in the city.—Journal American Medical Association, Chicago, February 3, 1923.

FOREIGN

The Child Welfare Association established at Central Aguirre, Porto Rico, has completed its first year's work. During this period 934 children under six years of age have been examined, weighed, and measured. Follow-up work by the nurse in the homes has resulted in remarkable improvement. The association has assisted with clothing and food in cases of illness and poverty. Ten children have been sent to the hospital for removal of tonsils and adenoids.

For 1923, this work will be supplemented by organizing Little Mothers' Leagues for girls from ten to fourteen years of age, classes in home hygiene and care of the sick for older girls and women, and first-aid classes for men.

The work is supported by individual subscriptions, the local Red Cross, and the Central Aguirre Sugar Company.—Bureau correspondence.

"Health in a Factory": An account of the work of the medical and dental departments and of the sick benefit and other schemes in operation in the Bournville cocoa and chocolate works, near Birmingham, issued in booklet form by the firm. The application of the plan to adolescent workers is described in The Child, London, December, 1922.

Compulsory Health Insurance of all Children attending the primary schools in Switzerland was ordered by a recent decree of the council of the Canton of Valais. The State will meet a part of the cost.—Bulletin des Eidgenossischen Gesundheitsamtes, November 4, 1922.

The Traveling Labrador Health Unit. By Stewart B. Sniffen, M. D.

The Labrador and the Newfoundland Nutrition Units (known among ourselves and a few intimate friends as the "Nut" units) were organized to cover, as far as possible, the territory of Dr. Grenfell's Mission, one unit starting from the north and the other from the south. In the Labrador Unit were Miss Marion Moseley, nutrition worker; Miss Catherine Cleveland, industrial worker; Dr. Russell Macfarlane, dentist; and myself. In each harbor all children were weighed and examined; physical defects were hunted down and presented to the parents with instructions as to treatment and earnest warnings with regard to what might be the dire result should they be neglected; corrections in faulty habits of eating, sleeping and sanitation, were urged as brought out by a social and medical history on each case; even the younger children manfully underwent the novel experience of having teeth filled and scraped and their swollen gums treated. The promise of a paper doll with a pink or blue dress went a long way toward heading off screams and struggles which often accompanied a first visit to the dentist. Each child was provided with a toothbrush and strictly admonished to use it every day—on his own teeth only. The family toothbrush in one home belonged to the tubercular grandmother and was used by all.

At each place, as soon as it was dark, the entire population gathered in the little schoolhouse, or the largest home, to hear a health talk illustrated by magic lantern pictures. Miss Moseley would first speak on food and health habits, infant care, home control, cod oil and goats; I would treat of the prevention of tuberculosis and deficiency diseases; and Dr. Macfarlane would discuss teeth and how to prevent their decay.

It is due to the kindness of friends—both business firms and individuals that the Grenfell Association has been able to institute the Child Welfare Work which is rapidly becoming such an important part of the Mission's task on the Labrador. We gratefully acknowledge the substantial aid received from the following contributors:

The firm of Chase & Sanborn for mailing of the Mission Christmas cards sold for benefit of the Children's Fund, Christmas, 1921 and 1922; also for their donations of tea and coffee to the staff at one center and to the members of the two traveling health units last summer.

National Child Welfare Association, Inc., New York, for colored health posters for the schools and nutrition centers and the loan of two sets of health slides for stereopticon lectures.

Chicago Tuberculosis Institute for sets of health posters for all schools and health centers.

Dr. E. V. McCollum of Johns Hopkins for a set of rat pictures showing results of deficiencies in diet.

Continental Scale Company, Chicago, for a contribution of scales to weigh the children.

Mr. Edward Coulson, of the firm of Coulson and Krieter, Chicago, for scalp salve for the children in all the schools and health centers.

The Dryco Company, New York, for their discount on milk for school lunches.

Dr. William R. P. Emerson, Boston, for supplying charts and records for nutrition classes in all the schools and health centers.

Mr. Frederick A. Flood, Boston, for a very generous donation towards the Fund.

Dr. Otto U. King, of the American Dental Association, for his loan of two sets of dental slides for stereopticon lectures.

Elizabeth McCormick Memorial Fund for Child Welfare, Chicago, for contribution toward scales to weigh the children and the loan of two sets of health slides for stereopticon lectures.

Miss Martha Peters and Miss Annie Culton of the Elizabeth McCormick Memorial Fund, for vegetable seeds for children's gardens.

Mr. Edward McDougal, Riverside, Illinois, for the gift of a magic lantern.

Hon. Robert McKinlay and the Board of Commissioners of Cook County, Illinois, for two American Toggenburg goats from the Oak Forest goat herd.

The National Dairy Council for pamphlets entitled, "What Milk Will Do for Your Child."

Metropolitan Life Insurance Company for health pamphlets.

Mrs. James A. Patton, Evanston, Illinois, for a thoroughbred Swiss Toggenburg goat.

Pepsodent Company, Chicago, for toothpaste to supply all the children in schools and at health centers.

Mr. Charles A. Stevens, Chicago, for a thoroughbred Swiss Toggenburg goat.

Vaughan's Seed Store, Chicago, for vegetable seeds for children's gardens.

Mrs. Ferdinand Wiegand, Highland Park, Illinois, for 1000 toothbrushes for all the children in schools and nutrition centers.

Also the many people who have given to the Children's Fund in smaller contributions.—Wilfred T. Grenfell.—Among the Deep-Sea Fishers, January, 1923.

Lectures on Dental Hygiene: The Admiralty, with the view of encouraging proper care of the teeth and to maintain a high standard of dental health, has given orders that dental officers are to supplement, by a series of lectures on oral hygiene, the individual instruction given to patients attending for treatment. Suitable lantern slides for lectures will be supplied by the Lantern Lecture Department at the Royal Naval College, Greenwich, and special slides will, if necessary, be prepared from illustrations. The lectures are to be given monthly at the training establishments and depots or as frequently as the commanding officer may consider desirable. All new entries must attend as part of their general instruction; the attendance of other ratings is voluntary.—British Medical Journal, September 9, 1922.

GENERAL

The constitutionality of the Sheppard-Towner Maternity Act of Congress was upheld in a decision handed down yesterday by Chief Justice Walter I. McCoy, of the District Supreme Court. The decision as to the constitutionality of the act was contained in a decision by the chief justice sustaining a motion filed by Secretary of the Treasury, Andrew Mellon, to quash the suit brought by Mrs. Harriet Frothingham, of Boston, Massachusetts, attacking the validity of the act.

"Congress is the body which in the first instance has the duty of deciding whether a proposed law may be constitutionally enacted," Chief Justice McCoy said. "It has made many appropriations apparently under the general welfare clause. This fact alone raises a doubt sufficient to lead to a decision that the motion to quash should be sustained until a more critical examination of the legislation on appeal is made."

In asking the court to take immediate action on the motion to quash the assistant United States Attorney said that it was desirable that the case be expedited to the United States Supreme Court, where a suit brought by the State of Massachusetts, testing the validity of the act, is scheduled for hearing in April.—Washington Post, February 17, 1923.

Reorganization of Government Departments: The plan of President Harding for reorganization of the government departments has been transmitted to Congress by the joint congressional committee on the reorganization of the administrative branch of the government.

An outstanding feature of the committee's report is the proposed creation of a department of education and welfare. This department would include a number of bureaus having functions related to public health, veteran relief and women and children's service, which are now functioning in at least a half dozen different departments of the government.

The proposed organization of the department of education and welfare follows:

(a) This is a new department, to have four major subdivisions, each in charge of an assistant secretary, as follows: Education; Health; Social Service, and Veteran Relief.

(b) Existing bureaus and offices to be transferred to the Department of Education and Welfare are as follows:

From the Department of the Interior: Bureau of Education; Indian Schools; Howard University; St. Elizabeth's Hospital; Freedman's Hospital; Bureau of Pensions.

From the Department of Labor: Women's Bureau (part); Children's Bureau (part).

From the Treasury Department: Public Health Service.

From the War Department: Soldier's Home.

From the Department of Justice: Office of the Superintendent of Prisons.

Independent establishments: Smithsonian Institution; Federal Board for Vocational Education; National Home for Disabled Volunteer Soldiers; Columbia Institution for the Deaf; Veterans' Bureau.

No immediate action is expected on the report of the committee. Its recommendations have the sanction of the Cabinet, but must await the action of the December session of Congress.—Journal of the American Medical Association, February 24, 1923.

The Death Rate Keeps Going Down Steadily. Seventy-five years ago, most of our large cities had a death rate of from 50 to 75 per 1000 per year. Twenty-five years ago, our large cities had cut this down to 25 or 30. Last year, with an average death rate for the registration area of 11.7 per 1,000, a few specially favored cities got down very close to 10 per 1,000. There was one week in 1921 when the death rate for New York was only a little over 8 per 1,000. There was one ward in Chicago last year in which the annual death rate was less than 8 per 1,000. Brooklyn claims the lowest death rate for 1921 of any large city, 8 deaths out of every 1,000 people. At a recent celebration of the centennial of the Kings County Medical Society, Dr. Royal Copeland, the Health Commissioner of New York, said that fifty years ago, the smallpox death rate was 32 per 1,000 per year, four times as much as the total death rate today. During the entire year of 1921, there was only one death in Brooklyn from smallpox and that was the first one in ten years. So rare has this disease become that there are probably today thousands of physicians who have been practicing medicine for years and who know smallpox only by hearsay. They have read about it in their books and journals, they have been told about it by older doctors, but they have never seen it. Fifty years ago, 27 people out of every 1,000 died each year in New York City from malaria. Today there is no malaria in New York. That makes 59 lives a year out of every 1,000 saved in one city by the control of just two diseases. The population of New York is 5,620,000 or 5,620 thousands. Control of two diseases saves 311,580 lives each year.—Health, March, 1923.

Prevention and Cure of Cancer: As its share in the nation-wide effort to inform the public of the known measures for the prevention and cure of cancer, the World's Work a few months ago published an article on the subject by Dr. Francis C. Wood, the distinguished director of the Institute of Cancer Research of Columbia University. A recent letter from Dr. Wood concludes with a paragraph which is so gratifying that we asked for and obtained his permission to publish it:

"You may be interested to know that the World's Work article on cancer has accomplished a lot even if you did most ingeniously blue-pencil most of my propaganda. I know of a number of people who have come to me on account of it with early carcinomata. They have now been operated upon and are safe. I am hearing the same thing from a great many of my medical colleagues. So if the World's Work has not been engaged in life saving before, you may be pleased to know that now it has to its credit a considerable number of lives saved for further usefulness."—World's Work, March, 1923.

Dr. Edward Ochsner says: The Medical Practice Act fence has been built too high and has too many holes at the bottom. We have built it so high that we require our medical students to study six years before they are allowed to treat the sick; and the irregulars with practically no training can crawl in through the holes in the bottom of the fence.

Many of the laws as they are passed are damaging enough, but worse than the laws themselves is the spirit in which they were passed the absolute disregard of the wishes and the desires of the medical profession. The Sheppard-

Towner bill will be followed by more drastic legislation and before we are aware of it we will be face to face with real "State Medicine." We have been able to fight that thing off so far but this Maternity bill makes a strong bid for ushering in State Medicine through our back door.—Illinois Medical Journal, February, 1923.

The Causes of Dental Disease: Some eighteen months ago, a committee was appointed by the Medical Research Council, in consultation with the Ministry of Health, for the purpose of carrying out an investigation into the causes of dental disease. The committee consisted of the following members: Professor Halliburton, Mr. Norman Bennett, Mr. Leonard Colebrook, Dr. J. M. Hamill, Sir Arthur Keith, Mr. P. P. Laidlaw, Mrs. Mellanby, Mr. J. Howard Mummery and Mr. C. J. Thomas.

It is proposed to issue from time to time reports on different portions of the work. The first of these reports has now been published, and may be obtained from H. M. Stationery Office at a cost of two shillings.

* * * * *

The report is written by Mr. Howard Mummery, and deals with "the structure of teeth in relation to dental disease." It is divided into three parts, as follows:

(1) A summary of existing knowledge in regard to variations in composition and structure of enamel and the relationship of these variations to caries.

(2) Report on the production of Artificial Caries.

(3) Report on Arrested Caries of the Teeth.—The Dental Surgeon, February 3, 1923.

"The Protection of Children Against Tuberculosis." By Dr. F. Humbert, Chief of the Division of Health Propaganda of the League of Red Cross Societies.—The World's Health, League of Red Cross Societies, Paris, December, 1922.

"The Health Game." By Marie L. Rose, R. N., Associate Director, Child Health Organization of America. This is the first of a series of articles on nutrition to be published in the American Journal of Nursing.—American Journal of Nursing, Rochester, New York, February, 1923.

You Pay Your Taxes: Do Your Taxes Pay You?: You work one day each week for government. For about a sixth of all you earn goes to pay taxes—whether you know it or not. For example, at least seventy-five cents out of every dollar paid to Uncle Sam pays for war, past or future war. National taxes won't come down much until we get along with less war. As for local taxes, are you getting your money's worth in roads, schools, protection, health and good all-round public service?—Colliers, March 3, 1923.

Machinist Sentenced for Violating Trade Mark Law—in Connection with Ames Crown and Bridge Cement: Edward Gluck, twenty-seven years old, a machinist of 1184 Fox Street, the Bronx, pleaded guilty before Justices Edwards, Herbert and McInerney in Special Sessions today to violation of the state trade mark law. He was sentenced to four months in the workhouse.

William E. Williams of Fremont, Ohio, manager of the W. V-B. Ames Company, dealers in dental supplies, testified that Gluck had sold thousands of packages of his own cement, wrongfully using the Ames label.—From the New York Sun, February 26, 1923.

The W. V-B. Ames Company desires to call attention to the above mentioned conviction of Edward Gluck of the Roma Manufacturing Company, 216 Center St., New York, for the sale of packages of cement purporting to be **Ames' Crown and Bridge Cement,** and to advise all persons that such packages are not genuine and the use of the Ames' label in connection with them illegal.

Harmless Cocaine Substitute: A substitute for cocaine in dental and eye operations, as also in minor surgery, has long been desired, and according to a recent report, it would seem that it has now been discovered in the form of a drug known as "Butyn." This drug is difficult to obtain in England, but a writer in the British Medical Journal, Dr. W. M. Beaumont, who obtained a supply from Chicago, and subjected it to a careful test, is enthusiastic in its praise. He has used this drug in eye work with success, and it has proved equally valuable in the hands of dentists. The drug is a synthetic product, and was discovered in the Abbott Laboratories of Chicago, with the help of Professors Adams and Kamm. It is stated to be less than half as toxic as cocaine, and does not deteriorate by keeping.

Dr. Beaumont declares "The anesthesia produced is more profound and prolonged

than when cocaine is used, and there are no after effects. Most important of all, from the public point of view, 'Butyn' has no attractions for the drug-taker."

It is not a derivative of cocaine and so can be freely prescribed without restriction.—The Dental Surgeon, January 27, 1923.

Ruthlessness: "Ruthless" is a forcible adjective, as becomes its Saxon origin. Headlong, sweeping, without pity, without consideration—such is the sort of action to which the word "ruthless" may properly be applied. It is not a pleasant adjective to have hurled at one; but it is to be feared that there are to be found only too many practitioners who deserve it, as habitually feeling far too little compunction in the extraction of teeth which, by the exercise of skill and patience, might be rendered safe and useful for many a long year. Mr. Tomlinson does well to denounce the impropriety of unnecessary extractions on the part of those who as professional men are bound to direct their treatment primarily to the preservation of natural organs. No strictures can be too severe to apply to anyone who resorts to extraction as a means of exploiting for his own ends a patient's ignorance, or even his inclination.—The British Dental Journal, February 1, 1923.

Dental Corps Orders from War Department.—Army: Captain Avery G. Holmes from duty at Fort Ontario, N. Y., to Camp Alfred Vail, N. J., for duty.

First Lieutenant Rufus W. Leigh promoted to captain from January 28.—Army and Navy Register, February 17, 1923.

Lieutenant Colonel Rex. H. Rhoades, now on duty as professor of military science and tactics, Northwestern University Dental School, Chicago, is relieved from duty at headquarters, 6th corps area.—Army and Navy Register, March 3, 1923.

Captain Howard A. Hale from duty in Philippine Department, upon completion of tour of foreign service, to duty at Jefferson Barracks, Mo.

Captain Elmer H. Nicklies from duty in Philippine Department, upon completion of tour of foreign service, to duty at Fort Bliss, Tex.—Army and Navy Register, March 10, 1923.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

American Dental Association, September 10-14, 1923, Cleveland, Ohio.

American Society of Orthodontists, April 9, 10, 11, 1923. Edgewater Beach Hotel, Chicago, Illinois.

American Medical Association, June 25 to 29, 1923, San Francisco, California.

American Academy of Periodontology, September 7 and 8, 1923, Statler Hotel, Cleveland, Ohio.

American Society of Oral Surgeons and Exodontists, September 4 to 7, 1923, Cleveland, Ohio.

American Dental Society of Europe, August 1, 2, 3 and 4, 1923, Paris, France.

American Society of Dental Radiographers, September 7 and 8, 1923, Cleveland, Ohio.

National Society of Denture Prosthetists, August 27 to September 8, 1923, Cleveland, Ohio.

Research Commission of the American Dental Association, September 8, at 8:30 P. M., Hollenden Hotel, Cleveland, Ohio.

Xi Psi Phi, September 7 and 8, 1923, Cleveland, Ohio. Headquarters, Winton Hotel.

STATE SOCIETIES

National Capital, first Tuesday of every month.

April

Alabama, at Birmingham (10, 11, 12).
Connecticut, at Hartford (19, 20, 21).
Kentucky, at Louisville (16, 17, 18, 19).
Kansas, at Wichita (9, 10, 11).
Maryland, at Baltimore (24, 25, 26).
Mississippi, at Laurel (17, 18, 19).
Missouri, at St. Louis (16, 17, 18).
New Jersey, at Trenton (11, 12, 13).
North Carolina-Virginia, at Pinehurst, N. C., (April 30, May 1, 2, 3).
Oklahoma, at Oklahoma City (23, 24, 25).
Texas, at Fort Worth (16, 17, 18, 19).
Virginia, and North Carolina, at Pinehurst, N. C., (April 30, May 1, 2, 3).

May

Arkansas, at Little Rock (15, 16, 17).
Illinois, at Decatur (8, 9, 10).
Indiana, at Indianapolis (14, 15, 16, 17).
Iowa, at Des Moines (1, 2, 3).
Massachusetts, at Boston (2, 3, 4).
Nebraska, at Omaha (14, 15, 16, 17).
New York, at New York City (9, 10, 11, 12).
Pennsylvania, at Philadelphia (15, 16, 17).
South Dakota, at Huron (10, 11, 12).
Tennessee, at Nashville (2, 3, 4, 5).
West Virginia, at Wheeling (21, 22, 23).

June

California, at San Francisco (11-15).
Colorado, Troutdale-in-the-pines, (14, 15, 16).
Idaho, at Boise.
Maine, at Augusta (26, 27, 28).
New Hampshire, at The Weirs (21, 22).
New Mexico, at Albuquerque (18, 19, 20).
North Dakota, at Bismarck (5, 6, 7).
South Carolina, at Myrtle Beach.
Southern California, at Los Angeles (18, 19, 20).
Utah, at Salt Lake City (6, 7, 8, 9).
Washington, at Walla Walla (11, 12, 13).
Wyoming, at Laramie (19, 20, 21).

July

Montana, at Missoula.
Wisconsin, at Milwaukee (10, 11, 12).

September

Delaware, at Wilmington (12).

November

Arizona, at Chandler (2, 3).
Georgia, at Athens (7, 8, 9).

Philadelphia Dental College Alumni Meeting, Philadelphia, Pennsylvania, April 18, 1923.

MEETINGS OF STATE BOARD OF DENTAL EXAMINERS

Alabama, at Birmingham Dental College, Birmingham, June 20. Secretary-Treasurer, H. C. Hassell, 616—22nd Avenue, Tuscaloosa, Alabama.

Arkansas, at Arlington Hotel, Hot Springs, July 9, 10 and 11. Secretary, H. J. Crume, Wilson Building, El Dorado, Arkansas.

California, at San Francisco, May 19, and Los Angeles, June 11. Secretary, C. A. Herrick, 133 Geary Street, San Francisco, California.

Colorado, at Denver, first Tuesdays of June and December. Secretary, Wm. H. Flint, Littleton, Colorado.

Connecticut, at Hartford, June 21, 22 and 23. Recorder, Arthur B. Holmes, 63 Bank Street, Waterbury, Connecticut.

Delaware, at Municipal Building, 10th and King Streets, Wilmington, June 20 and 21. W. S. P. Combs, Middletown, Delaware.

Georgia, at Capitol Building, Atlanta, May 28. Secretary-Treasurer, D. D. Atkinson. Brunswick, Georgia.

Illinois, at Room 1006 City Hall, 1007 County Building, Chicago, June 19, 20, 21, 22 and November 13, 14, 15, 16.

Indiana, at State House, Indianapolis, June 11 to 16 inclusive. Secretary, H. C. McKittrick, 1006 I.O.O.F. Building, Indianapolis, Indiana.

Iowa, at College of Dentistry, Iowa City, May 28. Secretary, C. B. Miller, 726 Fleming Building, Des Moines, Iowa.

Kansas, at Wichita, June 18 to 23. Secretary, G. F. Ambrose, El Dorado, Kansas.

Kentucky, at Louisville, June 11. Secretary, J. H. Baldwin, 908 Francis Building, Louisville, Kentucky.

Maine, at State House, Augusta, June 28, 29 and 30. Secretary, Henry Gilman, 192 State Street, Portland, Oregon.

Maryland, at University of Maryland, May 29, 30 and 31. Secretary, T. L. McCarriar, 1822 N. Charles Street, Baltimore, Maryland.

Massachusetts, at —, June 19, 20, 21, 22, 23, 25, 26, 27 and 28. Secretary, J. N. Carriere, 146 State House, Boston, Massachusetts.

Michigan, at Dental College, Ann Arbor, June 11 to 16 inclusive. Secretary, B. S. Southerland, 401 Ward Building, Owosso, Michigan.

Minnesota, at University of Minnesota College of Dentistry, Minneapolis, June 22 to 30 inclusive. Secretary-Treasurer, R. B. Wilson, 1133 Lowry Building, St. Paul, Minnesota.

Mississippi, at Capitol Building, Jackson, June 19. Secretary, B. J. Marshall, 6-7 Turner-Cox Building, Marks, Mississippi.

Montana, at Helena, July 9 to 12 inclusive. Marshall E. Gates, Helena, Montana.

Nebraska, at Omaha and Lincoln, June 5 to 9. Address, Department of Public Welfare, Lincoln, Nebraska.

New Jersey, at Trenton, June 25 to 29. Secretary, John C. Forsyth, 429 E. State Street, Trenton, New Jersey.

New York, at Albany, June 25 to 28 and September 24 to 27. Minor J. Terry, Albany, New York.

North Carolina, at Raleigh, June 14. Secretary, F. L. Hunt, Asheville, North Carolina.

North Dakota, at Fargo, second Tuesday in July. Wm. E. Hocking, Devils Lake, North Dakota.

Ohio, at Dental Department, Ohio State University, Columbus, June 25 to 29. Secretary, Ray R. Smith, 327 E. State Street, Columbus, Ohio.

Oklahoma, at State Capitol Building, Oklahoma City, June 26 to 29 inclusive. Secretary L. M. Doss, 245 American National Bank Building, Oklahoma City, Oklahoma.

Pennsylvania, at Pittsburgh and Philadelphia, June 20, 21, 22 and 23. Secretary, Alexander H. Reynolds, 4630 Chester Avenue, Philadelphia, Pennsylvania.

South Carolina, at The Jefferson Hotel, Columbia, June 22 and 23. Secretary, W. K. Walker, P. O. Box 714, Orangeburg, South Carolina.

South Dakota, at Sioux Falls, June 25, Secretary, L. R. Walston, Redfield, South Dakota.

Texas, at Dallas, June 18 to 21 inclusive. Secretary, R. L. Rogers, Amarillo, Texas.

Utah, at —, June 18 to 23. S. S. Burnham, 721 Boston Building, Salt Lake City, Utah.

Virginia, at Medical College of Virginia, Richmond, June 12, Secretary, J. P. Stiff, Fredericksburg, Virginia.

Washington, at Walla Walla, June 13. Director, Fred J. Dibble, Department of Licenses, Olympia, Washington.

West Virginia, at Huntington, June 26. Secretary, R. Mason Hite, Mannington, West Virginia.

Wisconsin, at Milwaukee, June 25 to 29 inclusive. Secretary, J. L. Blish, Fond du Lac, Wisconsin.

Wyoming, at Cheyenne, June 26, 27 and 28. Secretary, Peter Appel, Jr., P. O. Box 643, Cheyenne, Wyoming.

IOWA STATE DENTAL SOCIETY MEETING

The annual meeting of the Iowa State Dental Society will be held at Des Moines, Iowa, May 1, 2 and 3, 1923. Members of other state societies are cordially invited to be our guests. On request, a program will be sent.

E. S. SMITH, *Secretary,*
613 E. Court St., Iowa City, Iowa.

INDIANA STATE DENTAL ASSOCIATION

The Indiana State Dental Association will hold its sixty-fifth annual meeting at Indianapolis, May 14, 15, 16 and 17, 1923, at the Claypool Hotel.

All ethical dentists are cordially invited to attend. Dr. F. L. Gravis, Martinsville, Indiana is Master of Exhibits.

For further information write to

A. J. KIMM, *Secretary,*
704-5 Citizens Bank Bldg., Evansville, Ind.

NEW MEXICO STATE DENTAL SOCIETY MEETING

The annual meeting of the New Mexico State Dental Society will be held at Albuquerque, June 18, 19 and 20, 1923. For further information address

D. P. NOLTING, *Secretary-Treasurer,*
Albuqurque, New Mexico.

MASSACHUSETTS STATE BOARD OF DENTAL EXAMINERS

The Massachusetts Board of Dental Examiners will hold an examination for registration in dentistry June 19, 20, 21, 22, 23, 25, 26, 27 and 28.

All applications for examination, together with fee of $25.00, must be filed at the office of the Secretary, 146 State House, Boston, at least ten days before examination. Application blanks, examination rules and other information may also be obtained by writing,

J. N. CARRIERE, D.D.S., *Secretary,*
146 State House, Boston, Massachusetts.

THE AMERICAN DENTAL SOCIETY OF EUROPE

The next meeting of the American Dental Society of Europe will be held in Paris, August 1, 2, 3 and 4.

As it will be the fiftieth anniversary of the formation of this society, the meeting will be of especial interest.

Will you help by a paper, demonstration, or clinic, preferably the latter, to prepare a successful program, so that we may fittingly commemorate this important date in the history of our society?

F. W. FLEMING, *Secretary,*
13 Queen Anne St., London, W. 1.

ALABAMA STATE BOARD OF DENTAL EXAMINERS

The Board of Dental Examiners of Alabama will meet Monday, June 20, 1923 at nine o'clock A. M. at the Birmingham Dental College, (Birmingham High School) Avenue F & 20th Street, Birmingham, Alabama, for the purpose of examining applicants who hold diplomas from reputable dental colleges, for certificates of qualification to practice dentistry, in Alabama.

Please note the following important change in practical requirements; upper, fixed, sanitary bridge will be substituted for the inlay, to consist of a three-quarter or hood crown on the first molar, with sanitary pontics or dummies; to be waxed up in occlusion but not soldered, and to be mounted on a typodent or extracted teeth, properly set in plaster casts and mounted on the articulator. All work including the preparation of abutments to be done before the board except, that if porcelain root tips are used on pontics or dummies, they must be baked before coming to the examination.

All applications accompanied by the examination fee must be filed with the secretary-treasurer, at least one week before the examination. For further information, application blanks, etc., address,

H. C. HASSELL, *Secretary-Treasurer,*
616—22nd Ave., Tuscaloosa, Alabama.

COLORADO STATE BOARD OF DENTAL EXAMINERS

The Colorado State Board of Dental Examiners holds its examinations the first Tuesday of June and December, continuing five days. The first three days are devoted to the practical examination held in the Colorado College of Dental Surgery, Denver; the last two days to written examination held in the Capitol Building. For further information, write,

WM. H. FLINT, *Secretary,*
Littleton, Colorado.

CALIFORNIA STATE BOARD OF DENTAL EXAMINERS MEETING

The next examination by the Board of Dental Examiners of California of applicants for a license to practice dentistry in that state will be held at San Francisco, beginning on

May 19, at 9 A. M. This examination will be followed by an examination to be held at Los Angeles, beginning at 8 A. M., on June 11, 1923.

An examination of applicants for a license to practice as a dental hygienist in California will be held at San Francisco, beginning on May 19, at 9 A. M. For further particulars, address C. A. HERRICK, *Secretary,*
133 Geary Street, San Francisco, California.

GEORGIA STATE BOARD OF DENTAL EXAMINERS

The Board of Dental Examiners of Georgia will meet at the Capitol Building, Atlanta, on May 28, at nine o'clock A. M. sharp, for the purpose of examining applicants for license to practice dentistry in Georgia.

THOS. COLE, *President,*
D. D. ATKINSON, *Secretary-Treasurer,*
B. D. E. of Ga.

ILLINOIS STATE BOARD OF DENTAL EXAMINERS

The Department of Registration and Education, Springfield, Illinois, announces the following dates for examinations for licenses to practice: June 19, 20, 21 and 22; November 13, 14, 15 and 16, Room 1006 City Hall, 1007 County Building, Chicago, Illinois.

INDIANA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Indiana State Board of Dental Examiners will be held from June 11 to 16 inclusive at State House in Indianapolis.

For further information, address,
H. C. MCKITTRICK, *Secretary,*
1006 I.O.O.F. Bldg., Indianapolis, Indiana.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

The next examination for license to practice in Kentucky will be Monday, June 11, 1923, at Louisville, commencing at eight A. M. Graduates of schools classified as A and B by the Dental Educational Council are eligible to examination. For blanks and detailed information apply to J. H. BALDWIN, *Secretary,*
908 Francis Building, Louisville, Kentucky.

MAINE STATE BOARD OF DENTAL EXAMINERS

The Maine Board of Dental Examiners will hold its annual meeting at the State House, Augusta, Maine, June 28, 29 and 30, 1923. Applicants must have their application in the hands of the secretary on or before June 18.

For further information, address,
HENRY GILMAN, *Secretary,*
192 State St., Portland, Maine.

MARYLAND STATE BOARD OF DENTAL EXAMINERS

The Maryland State Board of Dental Examiners will meet for the examination of candidates at the University of Maryland, May 29, 30 and 31, 1923 at nine A. M.

For further information and application blanks, address,
T. L. MCCARRIAR, D.D.S., *Secretary,*
1822 N. Charles St., Baltimore, Maryland.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The next regular meeting of the Minnesota State Board of Dental Examiners will be held at the University of Minnesota College of Dentistry, in Minneapolis, Minnesota, June 22 to 30, inclusive. All applications must be in the hands of the secretary on or before June 22. For further information apply to,
R. B. WILSON, *Secretary-Treasurer,*
1133 Lowry Bldg., St. Paul, Minnesota.

NEW JERSEY BOARD OF REGISTRATION

The State Board of Registration and Examination in dentistry of New Jersey will hold their regular examination at Trenton, New Jersey, June 25 to 29, 1923. License fee, $25.00; re-examination fee, $10.00.

Practical tests required are: Insertion of an approximal gold filling with the approximating tooth in position, compound approximal amalgam filling, and a silicate filling; candidate must furnish his own patient. Taking of impressions, bite, selection of teeth, articulation, trial plate; candidate must furnish his own patient. Practical examination in mouth diagnosis.

Attention is directed to the following quotation from the dental law of New Jersey: "Applicant shall present to said board a certificate from the Commissioner of Education of this state, showing that before entering a dental college he or she had obtained an academic education consisting of a four-year course of study in an approved high school, or the equivalent thereof." In accordance with this law the secretary will issue application blanks only upon presentation of the required certificate from the Commissioner of Education, State House, Trenton, New Jersey.

Application must be filed, complete, ten

days before the date of the examinations. Address all communications for further particulars to

JOHN C. FORSYTH, *Secretary,*
429 E. State St., Trenton, N. J.

NEBRASKA STATE BOARD OF DENTAL EXAMINERS

The spring examination of the Nebraska State Board will be held at Omaha and Lincoln, June 5 to 9, 1923. Applicants should file their applications at least two weeks prior to the date of examination; blanks may be obtained from Department Public Welfare, Lincoln, Nebraska. Practical examinations held at Omaha and Lincoln, written all in Lincoln.

NEW YORK STATE BOARD OF DENTAL EXAMINERS

The 1923 meetings of the New York State Board of Dental Examiners will be held at Albany, New York, June 25 to 28 and September 24 to 27. For further information, communicate with

MINOR J. TERRY,
Albany, New York.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the North Carolina State Board of Dental Examiners will be held at Raleigh, North Carolina, beginning promptly at nine o'clock on Thursday, June 14, 1923.

For further information and application blanks, address,

F. L. HUNT, *Secretary,*
Asheville, North Carolina.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the North Dakota State Board will be held in Fargo, the second Tuesday in July. For further information, write

WM. E. HOCKING,
Devils Lake, North Dakota.

OHIO STATE BOARD OF DENTAL EXAMINERS

The next examination of the Ohio State Dental Board will be held the week beginning Monday June 25, at the Dental Department of the Ohio State University, Columbus.

RAY R. SMITH, *Secretary,*
327 E. State St., Columbus, Ohio.

PENNSYLVANIA STATE BOARD OF DENTAL EXAMINERS

The next examination of the Pennsylvania Board will be held in Pittsburgh, and Philadelphia, on Wednesday, Thursday, Friday and Saturday, June 20, 21, 22 and 23.

An examination for dental hygienists will be held at the same places on June 21, 22 and 23.

For further information, address

ALEXANDER H. REYNOLDS, *Secretary,*
4630 Chester Ave., Philadelphia, Pennsylvania.

MEETING OF BOARD OF DENTAL EXAMINERS OF SOUTH CAROLINA

The South Carolina State Board of Dental Examiners will hold its next regular meeting at The Jefferson Hotel, Columbia, South Carolina, June 22 and 23, 1923.

For information and application blanks address

W. K. WALKER, *Secretary,*
P. O. Box 714, Orangeburg, S. C.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the South Dakota Board for examination of candidates for license will be held at Sioux Falls, South Dakota, commencing Monday June 25, at one P. M. For application blanks and further information address

L. R. WALSTON, *Secretary,*
Redfield, South Dakota.

VIRGINIA STATE BOARD OF DENTAL EXAMINERS

The next regular annual meeting of the Virginia State Board of Dental Examiners will be held in the city of Richmond, Virginia, June 12 at nine A. M. at the Medical College of Virginia.

For further particulars, address,

J. P. STIFF, *Secretary,*
Fredericksburg, Virginia.

THE CONNECTICUT DENTAL COMMISSION MEETING

The Connecticut Dental Commission will meet at Hartford, Connecticut, on June 21, 22 and 23, to examine applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before them. For further information apply to

ARTHUR B. HOLMES, *Recorder,*
63 Bank Street, Waterbury, Connecticut.

WYOMING STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Board will be held at Cheyenne, Wyoming, June 26, 27 and 28, 1923. For further information and application blanks, address

PETER APPEL, Jr., *Secretary,*
P. O. Box 643, Cheyenne, Wyoming.

RESEARCH COMMISSION MEETING

The annual meeting of the Research Commission of the American Dental Association will be held September 8, 1923, at 8:30 P. M., Hollenden Hotel, Cleveland, Ohio.

PHILADELPHIA DENTAL COLLEGE ALUMNI MEETING

The sixtieth annual meeting of the Alumni Society of the Philadelphia Dental College will be held at the College Building, 18th and Buttonwood Streets, on Wednesday, April 18, 1923.

The essayists for the morning session will be Drs. Ernest LaPlace, Philadelphia; Henry I. Dorr, Massachusetts; and C. J. Hollister, Harrisburg, Pennsylvania. The following clinics have been arranged for the afternoon session:

Porcelain Jacket Crown—Raymond Clark, Mt. Holly, New Jersey.

Orthodontia for the Practitioner—A. F. Jackson, Philadelphia.

Cases for Diagnosis—C. N. Russell.

The Correct Interpretation (X-ray) of the Lower Molar and its Removal—L. B. Duffield.

The Dental Hygienist—Helen M. Beck.

Reservations for these clinics can be had by communicating with Dr. W. J. Robinson, 4906 Walnut Street, Philadelphia, Pennsylvania.

The banquet will be held at Bellevue-Stratford at 6:30 P. M. Tickets for same can be secured from Dr. M. Hagopian, Perry Building, 16th and Chestnut Streets, Philadelphia, Pennsylvania. Ladies are invited.

LEON A. HALPERN, *Secretary,*
2438 N. 33rd St., Philadelphia, Pa.

BI-CENTENARY OF PIERRE FAUCHARD

This year marks the two hundredth anniversary of the completion of the writing of Fauchard's "Le Chirurgion Dentiste." The first District Dental Society and the Dental Society of the State of New York has seen fitting to commemorate this event, by an exhibit during the state meeting of early dental literature and other historical material. Thursday evening, May 10, will be devoted to a series of addresses by Dr. J. J. Walsh, "Medicine and Dentistry"; Dr. Herman Prinz, "Fauchard and his Works," and "Influence of Fauchard on Dentistry."

The above societies extend an invitation to all members of the profession to be present.

B. W. WEINBERGER, *Chairman.*

RESOLUTIONS ON THE DEATH OF DR. FRANK R. CHAPMAN

WHEREAS, in the death of Frank R. Chapman, both organized dentistry and the civic activities of Columbus have lost a willing, capable and loyal worker, and,

WHEREAS, the name of Dr. Chapman has been so intimately associated with the progress of the dental profession in Ohio, for more than a quarter of a century, viz:

First, Having served, for three years, as an instructor in the dental department of the Ohio Medical University;

Second, Having served in various official positions in the Columbus and the Ohio State Dental Societies throughout this time;

Third, Having served as secretary of the Ohio State Dental Society for more than eighteen years continuously;

Fourth, Having served as a member and secretary of the Ohio State Dental Board for two years;

Fifth, Having served as the dental member of the Franklin County Advisory Medical Draft Board during the World War; therefore be it,

Resolved, That the Columbus Dental Society in regular session assembled, February 27, 1923, officially expresses its sincere appreciation for the friendly companionship, able counsel and efficient services of Dr. Chapman, as well as the great sorrow felt by our entire membership through his untimely death. And be it further

Resolved, That these resolutions be incorporated in the permanent records of our society and that a copy, as an evidence of our affection and as an expression of our deepest sympathy, be presented to Mrs. Chapman by the secretary; also, that copies be forwarded to the editors of the Dental Summary and the Journal of the American Dental Association.

HOMER C. BROWN, *Chairman,*
A. O. ROSS,
HARRY COPE.

AMERICAN DENTAL ASSOCIATION

TWENTY-SEVENTH ANNUAL MEETING

CLEVELAND, OHIO, SEPTEMBER 10-14, 1923

HOTEL RESERVATIONS

In securing hotel reservations for the coming convention, consult the hotel rate-sheet and fill out the blank application below. Mail it *immediately* to the *hotel* you wish to patronize. The hotel will then advise you of the reservation which they make for you.

KEEP THIS REMINDER OF YOUR RESERVATION

S. MARSHALL WEAVER
Chairman
Hotels and Halls Committee
618 Rose Building,
Cleveland, Ohio.

Hotel Selected .....

No. of Rooms .....

No. of Persons .....

Date of Reservation .....1923.

Detach here and keep the above for reference

MAIL THIS APPLICATION DIRECT TO HOTEL

HOTEL RESERVATION

American Dental Association, Cleveland, Ohio, September 10-14, 1923

.....HOTEL 1923
Cleveland, Ohio.

Please reserve the sleeping accommodations noted below:

.....Room(s) with bath for.....people. Rate desired $.....
(per day)

.....Room(s) without bath for.....people. Rate desired $.....
(per day)

I hereby agree to pay for rooms described from morning / evening of September .....to September ....., unless cancellation is made by August 20, 1923.

List names and addresses of all who will occupy the room with you.

Name ..... Address .....
Street, City and State

Name ..... Address .....
Street, City and State

Name ..... Address .....
Street, City and State

Name .....

Street .....

City .....State .....

HOTEL ROOM RATES—CLEVELAND

HOTEL	Room Capacity	ROOM WITH BATH		ROOM WITHOUT BATH	
		One person per day	Two persons per day	One person per day	Two persons per day
ANSONIA 3848 Prospect Ave.	76	2.00-2.50	3.50- 4.50		
CLARENDON St. Clair Ave. & Ontario	50			1.25-1.50	2.00-2.50
CLEVELAND Superior Ave., Public Square	1000	3.00-7.00	4.50-10.00		
COLONIAL 523 Prospect Ave., S. E.	150	2.50-3.50	4.00- 5.00	2.00-2.50	3.00-3.50
DOANBROOKE (Apts.) E. 105th at Euclid Ave.	122	2.50-7.50	4.00-10.00		
EUCILD Euclid Ave. at E. 14th St.	200	2.50-3.50	4.00- 6.00	1.50-3.00	2.50-4.00
GILLSY 1811 E. 9th St.	350	2.00-	3.00- 4.00	1.50-	2.50-3.00
HOLLENDEN Superior Ave. at E. 6th St.	800	3.00-6.00	5.00- 8.00		
MECCA 1862 E. 9th St.	120	1.50-2.00	3.00-	1.50-	
NEW AMSTERDAM Euclid Ave. at E. 22nd St.	350	2.00-	3.50- 4.00		
OLMSTEAD Superior Ave. at E. 9th St.	300	2.00-4.00	4.00- 6.00		
STATLER Euclid Ave. at E. 14th St.	1000	3.00-8.00	4.50-10.00		
TALGARTH 1924 Prospect Ave.	75	1.50-2.50	2.00- 3.50	1.25-1.50	1.75-2.25
WINTON Prospect Ave. at E. 9th St.	600	3.00-5.00	5.00- 8.00		

That all members desiring to attend the Convention may be comfortably housed in hotels in the downtown district, the Hotels of Cleveland have been asked to fill each room to its regular capacity. Members, therefore, are requested to procure a room-mate or mates wherever possible, and request rooms for groups of 2, 3 or 4 persons.

GENERAL INFORMATION

CLUBS

Cleveland Athletic Club, 1120 Euclid Avenue.

Union Club, 1211 Euclid Avenue.

University Club, 3813 Euclid Avenue.

Y. M. C. A., 2200 Prospect Avenue.

Y. W. C. A., Prospect Avenue and East 18th Street.

Sections have been assigned to individual hotels where all their meetings will be held.

All Headquarters are within five minutes' walk of each other.

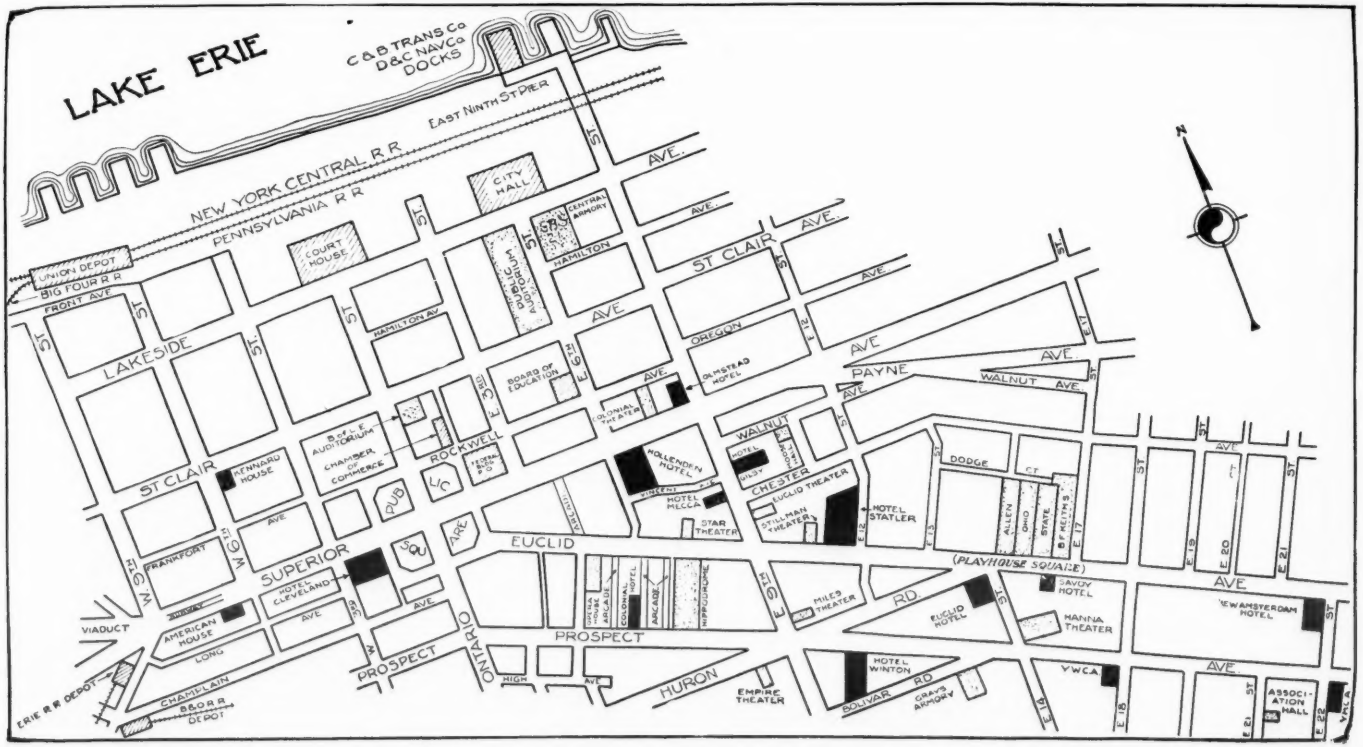
Write to hotels direct for information.

SECTION HEADQUARTERS

General Sessions, Public Auditorium.
Operative Dentistry, Cleveland Hotel.
Full Denture Prosthesis, Winton Hotel.
Partial Denture Prosthesis, Winton Hotel.
Oral Surgery, Hollenden Hotel.
Orthodontia, Statler Hotel.
Periodontia, Statler Hotel.
Scientific Research, Public Auditorium.
Mouth Hygiene and Public Instruction, Public Auditorium, (main floor.)
Clinics (except surgical) Public Auditorium.
Exhibit, Public Auditorium.

HOUSING HEADQUARTERS

Official Family, Hollenden Hotel.
Delta Sigma Delta Fraternity, Statler Hotel.
Psi Omega Fraternity, Cleveland Hotel.
Xi Psi Phi Fraternity, Winton Hotel.



MAP OF HOTEL SECTION OF CLEVELAND

MASSACHUSETTS DENTAL SOCIETY

The fifty-ninth annual meeting of the Massachusetts Dental Society will be held at the Copley-Plaza Hotel, Boston, Massachusetts, May 2, 3 and 4, 1923.

The Executive Committee of the society wishes to extend a cordial invitation to all ethical dentists to attend the meeting. The Councillors' meeting for transaction of society business will be held on Tuesday, May 1. (Hour to be announced later).

Wednesday evening will be devoted to a reception, entertainment and dance. The large ball-room of the hotel will be brimming full of exhibits.

The meeting will be conducted under four sections, lectures and teaching clinics being provided by each section. Lectures will be open. Admission to the teaching clinics will be by special tickets only.

Teaching Clinics in Operative Section.

By T. W. Maves, D.D.S., University of Minnesota, Minneapolis.
William Dwight Tracy, D.D.S., New York City, and others.

Teaching Clinics in Prosthetic Section.

By M. M. House, D.D.S., Deaner Dental Institute, Kansas City, Missouri.
W. E. Cummer, D.D.S., Royal College of Dental Surgeons, Toronto, Ontario.

Teaching Clinics in Oral Surgery Section.

By Arthur E. Smith, D.D.S., M.D., Chicago, Illinois.
Clarence O. Simpson, M.D., D.D.S., St. Louis, Missouri.

Teaching Clinics in Preventive Dentistry Section.

By John Oppie McCall, A.B., D.D.S., Columbia University, New York.
Wallace Seccombe, F.A.C.D., Royal College of Dental Surgeons, Ontario, and others.

Members who wish to apply for tickets to the teaching clinic will be charged a registration fee of $2.00 for each section which will entitle them to all teaching clinics under the section.

Non-members who wish to apply for tickets will be charged a registration fee of $10.00 in addition to the regular section registration fees.

For application to teaching clinics apply to the secretary.

Reduced railroad rates will be granted by the New England Passenger Association from points in New England States and from Albany and New York City in New York.

W. VERNON RYDER, *Secretary*,
175 Newbury St., Boston, Massachusetts.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Delaware State Board of Dental Examiners will be held June 20 and 21, Municipal Bldg., 10th and King Streets, Wilmington, Delaware. For further information, address,

W. S. P. COMBS,
Middletown, Delaware.

UTAH STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Utah State Board be held beginning June 18, lasting for one week. For further information, address,

S. S. BURNHAM,
721 Boston Bldg., Salt Lake City, Utah.

WASHINGTON STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Washington State Board of Dental Examiners will be held at Walla Walla, June 13, 1923. For further information address,

FRED J. DIBBLE, *Director*,
Department of Licenses,
Olympia, Washington.

WEST VIRGINIA STATE BOARD OF DENTAL EXAMINERS

The West Virginia Board of Dental Examiners will hold license examination for dentists and dental hygienists at Huntington, June 26, 1923. For full information, application blanks, etc., address,

R. MASON HITE, *Secretary*,
Mannington, West Virginia.

THE AMERICAN SOCIETY OF DENTAL RADIOGRAPHERS

The third annual meeting of the American Society of Dental Radiographers will be held at the Hotel Statler, Cleveland, Ohio, on Friday and Saturday, September 7 and 8. An interesting scientific program is being prepared.

All members of the American Dental Association interested in the science of dental radiography are very cordially invited to attend.

JAMES H. PROTHERO, *President*,
Marshall Field Bldg., Chicago, Ill.
MARTIN DEWEY, *Secretary*,
501 Fifth Ave., New York, N. Y